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Management Digest®

TECHNICAL • INDUSTRIAL • COMMERCIAL

NOVEMBER 1956

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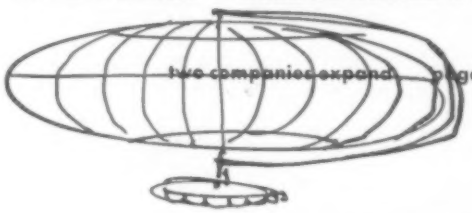

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4 reverse to 28.5 mph

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Engine: gasoline, 63 brake hp
diesel, 77 brake hp
Weight: gasoline, 11,300 lb
diesel, 11,500 lb
Speeds: 4 forward to 20 mph
4 reverse to 25 mph

TL-12

4-wheel drive
Capacity: 1¼ cu yd
Engine: gasoline, 63 brake hp,
diesel, 77 brake hp
Weight: gasoline, 12,100 lb,
diesel, 12,300 lb
Speeds: 4 forward to 20 mph
4 reverse to 25 mph

ALLIS-CHALMERS, EXPORT DEPARTMENT MD1156, TRACTOR DIVISION, MILWAUKEE 1, U. S. A.

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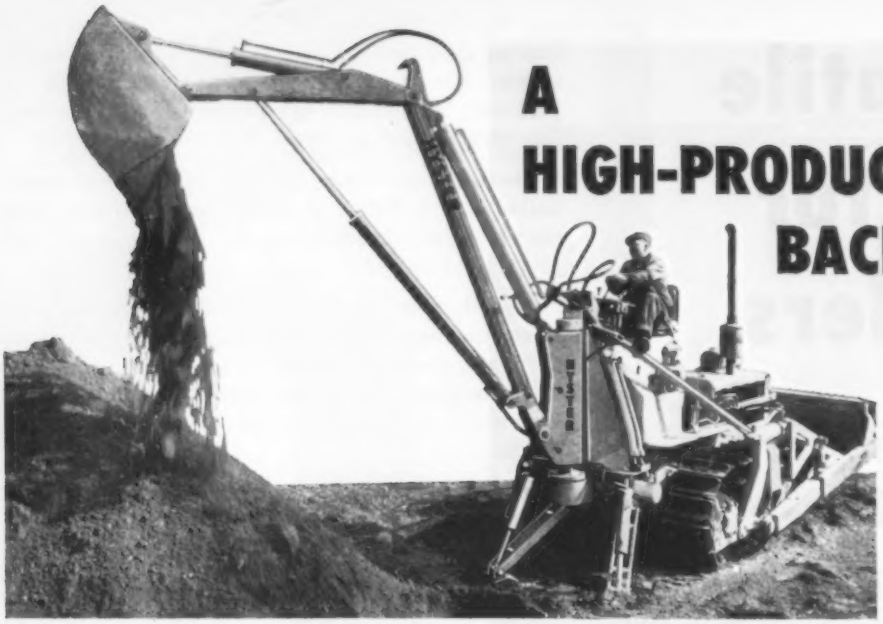

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NEW YORK CITY
NOVEMBER, 1956

Who You Are, What You Do

YOU ARE 39 years old. You own an automobile, and your own home; you have a wife and two children. You read French, Spanish—and perhaps German—as well as English. You have a responsible job in a manufacturing, processing, or raw-material producing industry; indeed, you are probably an officer or a department head in that business. In the next year you will take at least one business trip—by air—outside your own country. And you spend one hour and 52 minutes each month reading MANAGEMENT DIGEST.

This person may not, after all, be you. But we know that he is a fairly typical reader of this magazine.

Earlier this year, I wrote to 5,000 readers of MANAGEMENT DIGEST, enclosing a detailed questionnaire about their business and interests. A large percentage responded in full, and the answers provide a complete statistical portrait of the MANAGEMENT DIGEST subscriber. This is extremely useful to the editors: The better we know you, the better magazine we can produce for you.

We were especially pleased with the vote of confidence you gave to MANAGEMENT DIGEST. More than half of those readers who subscribed to the magazine before its name and contents were changed, just a year ago, reported that the new MANAGEMENT DIGEST was more interesting and helpful to them; 45% said that it was at least as useful. We found, by the way, that each issue has an average 4.3 readers—so we know that you are passing the magazine on to your colleagues.

We learned that 47% of the readers are general officers and their assistants, 21% are department or division heads and their assistants, 20% are engineering and other professional personnel. They often have multiple business interests: 37% say they are the officer, owner, or director of more than one company. The magazine has many young readers—17% say they are under 30, while 34% are between 31 and 40, 29% between 41 and 50, the rest older.

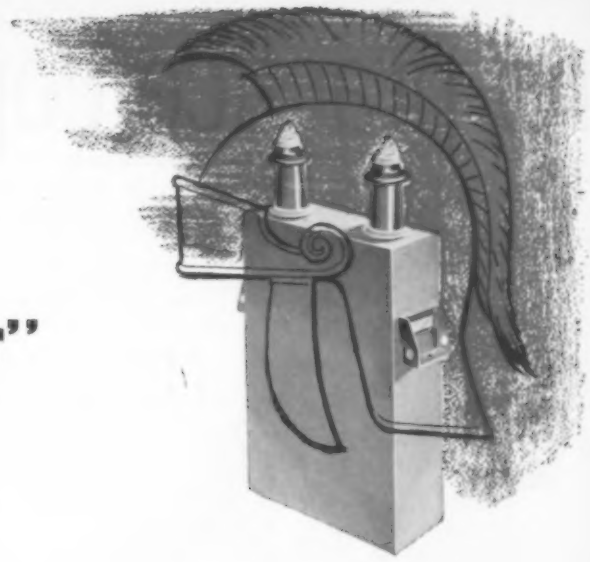
The readers are auto-minded. Four fifths say they own a car—or cars. (One gentleman claims ownership of "more than nine.") Apparently 48% of the readers have bought American cars, with British and German autos in second and third place. And 81.5% of the readers say they are connected with businesses that rely on the U.S.A. as the major supplier of imported equipment and materials.

There is a lot of business travel among MANAGEMENT DIGEST readers. About 70% planned at least one business trip outside their home country this year; 45% will make two or more trips. 81% will fly to their destination. Three quarters of the readers will visit European countries, and almost half will come to North America.

Do call on us here at McGraw-Hill if we can be of any service during a U.S. stay. And I want to thank each one of you who took the time to answer the questionnaire. Your cooperation and continuing interest in this magazine are very much appreciated.

Paul R. Miller, jr

Capacitors with a real "Coat of Armor" do a better job for you



If low power factor is inflating your electricity bill, you need capacitors to set things right. Before you buy, however, be warned that all capacitors do not offer the same value for your money.

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GEORGE MORGAN, *Supervisor*
Transformer Section

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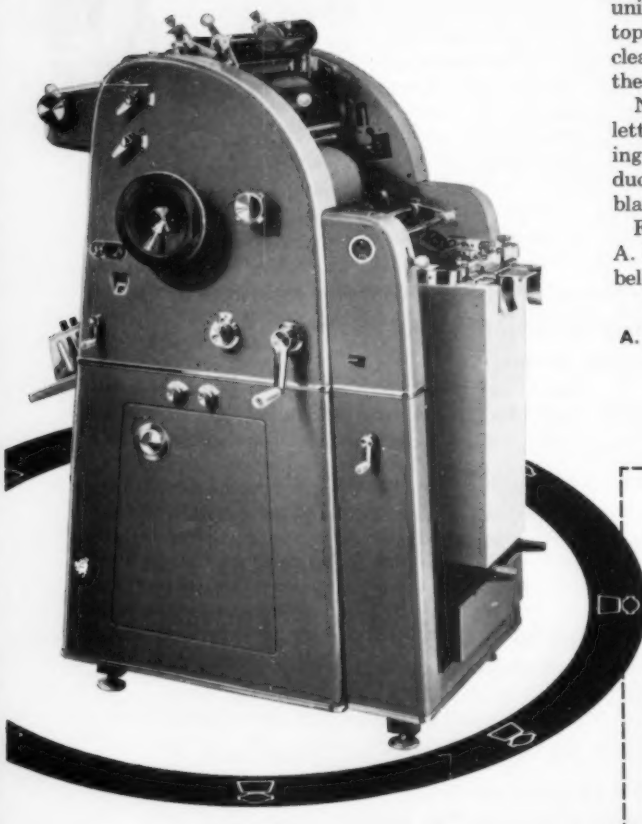

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▶ WORLD TRENDS

NEW HOPE FOR EUROPE

Never before has the cause of European economic unity looked so promising. Next year, you may see the outlines of a huge free trade area, called the "Common Market," taking shape on the Continent. And Britain may be playing an active role.

Indeed, it is Britain that has given new life to the Common Market idea. In a sudden change of policy, London seems ready to join with its Continental neighbors in a drive to lower tariffs, and stimulate trade in a European customs union or low-tariff "club".

The drive toward a free trade area is coming from the six nations that formed the European Coal & Steel Community. "Europe-minded" statesmen are emphasizing that only in unity can Western Europe maintain its strength and freedom of action. Their hope is to create a real mass market in Europe, and to mobilize capital both for European and overseas development.

No one knows how far, how fast, the march toward European integration will proceed. But the stage seems set for historic developments—that will effect the entire world's business and political relationships with Britain and the nations of Europe.

FIRST FORECASTS

The economists are optimistic about world business in 1957, and expect continuing growth in most nations. They do make these reservations:

• **The rate of growth of production in most industrial countries** is likely to slow. The problem (particularly in Western Europe) is not lack of demand, but in lack of labor supply and production capacity. Another worry is the continuing battle against inflation. There is fear that too inflexible "tight money" policies by governments could bring a sharp business decline.

Two comments may be in order: (1) Credit is not being used for speculative purposes on anywhere near the scale of, for example, 1929; and (2) governments can reverse their "tight money" policies quickly.

• **There may be a tendency for prices of primary materials to decline**—affecting the exports of raw-material producing nations to industrial areas. Only a very few commodities will benefit from increasing inventories.

Another comment: If this happens, there will be increasing pressure from primary-producers for price stabilization schemes (page 13), loans, a "more profitable share" of the world's business. Indeed, the debate between the industrial nations and less developed nations may well dominate 1957 business—with important political implications as well.

SHIPPING PROBLEM

Expanding trade, uncertainty at Suez—these are combining to produce a shortage of shipping.

Oil is the dramatic example; the oil industry is hurrying to build new tankers (page 14). But buyers and sellers of all other goods—machines or textiles, wheat or manganese—feel the shipping problem. Ship charter rates are rising, freight rates are rising.

A Suez Canal slow-down, or a large diversion of ships around Africa,

Turn the page for more WORLD TRENDS

would of course mean immediate, severe difficulty for businessmen in many nations.

Yet the shipping surge became apparent even before the Suez crisis. It is caused by high levels of world trade, huge bulk shipments of U. S. coal and surplus farm products, heavy buying by many nations for their development programs.

OUTLOOK IN BRITAIN . . .

Few nations feel Middle East tension more than Britain. A few months ago, it looked as if the unhealthy domestic "boom" had eased. Exports had revived, imports had stabilized, prices stopped rising. The over-all balance of payments was showing a surplus.

Then Suez (1) forced the government to reconsider its plans to reduce defense spending; and (2) frightened foreign traders with the prospect that all the past months' economic gains would be lost. Confidence in sterling was damaged just at the time of year when sterling usually shows a seasonal weakness.

The point to remember is this: Weakness in sterling reflects worry about the future rather than any real change in Britain's financial position. Events over the next few months will show whether Middle East problems will harm the British economy.

. . . AND IN BRAZIL . . .

Brazil does not worry much about Suez. It has problems at home. Rio de Janeiro prices have risen about 15% so far this year; the government is forced to print more money to meet its obligations. External debts are about $1,500-million. In six months alone, the nation had to spend $135-million on oil imports.

Yet Brazil has achieved a favorable balance of payments, thanks to large coffee exports (more Americans are drinking more coffee than ever before, according to a new survey) and import restrictions. The new government of President Kubitschek seems firmly in office.

The U. S. A. has agreed to a liberal program of financial help, and foreign businessmen are increasing their interest in Brazil. The Germans are going ahead to make Brazil the site of their largest overseas investments (in chemicals, steel, diesel engines, and so on); Americans, Japanese, Italians, Swiss, French, and others are entering the market in increasing number. Brazil's industrial plant continues to grow.

So the outlook presents the familiar Brazilian paradox: More financial trouble, more growth.

WASHINGTON'S REAPPRAISAL

The reappraisal of the American foreign aid program is moving ahead—in the White House, in the Congress, in government agencies.

Perhaps the government's major problem is to "re-sell" the concept of aid in the U. S. A. itself—not as a military measure, but as a way for the U. S. to use its wealth and power to help other nations build strong, growing economies.

This study will take time. But there is one new idea known to be under consideration by the Administration. That is to finance economic assistance out of a revolving, long-term, low-interest loan fund. The fund would be created by funneling all repayments of principal and interest on outstanding U. S. loans abroad. That would provide at least $600-million yearly for some time ahead.

Most observers believe that the consensus of the new thinking will point to at least the same amount of aid as today—but in new forms.

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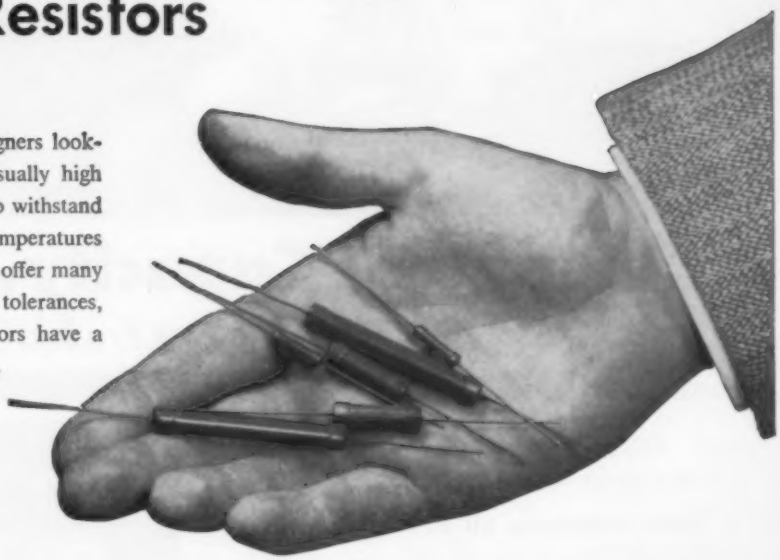

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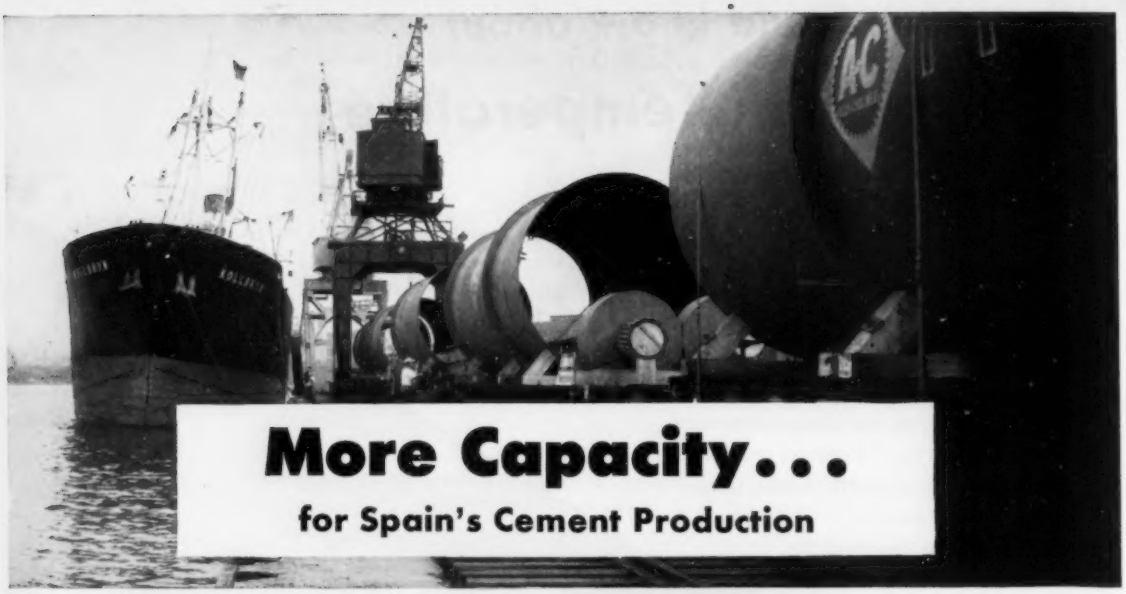

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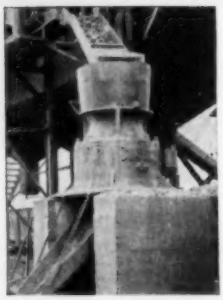

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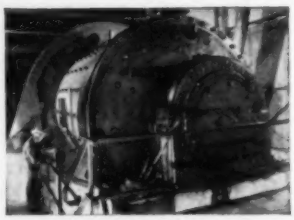

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BRAZIL—Rio de Janeiro, São Paulo, Recife (Pernambuco), Porto Alegre.
BRITISH BORNEO—Sandakan, Jesselton.
BURMA—Rangoon.
CANADA—Montreal.
CHILE—Santiago.
COLOMBIA—Barranquilla, Bogotá, Medellín, Cali.
COSTA RICA—San José.
CUBA—Havana.
DOMINICAN REPUBLIC—Ciudad Trujillo.
ECUADOR—Quito.
EL SALVADOR—San Salvador.
ENGLAND—London.
FINLAND—Helsinki.
FRANCE—Paris.
GREECE—Athens.
GUADELOUPE—Pointe-à-Pitre.
GUATEMALA—Guatemala City.
HAITI—Port-au-Prince.
HAWAII—Honolulu, Hilo.
HONG KONG—Hong Kong.
ICELAND—Reykjavik.
INDIA—Bombay, Calcutta.
IRAN—Teheran.
IRAQ—Baghdad.
ISRAEL—Tel-Aviv.
ITALY—Milan.
JAMAICA—Kingston.
JAPAN—Osaka, Tokyo.
KENYA—Nairobi.
MALAYA—Kuala Lumpur, Ipoh, Kota Bharu, Penang, Malacca, Seremban, Kuantan.
MEXICO—Guadalajara, Mexico City, Monterrey.
NETHERLANDS—Amsterdam.
NEW ZEALAND—Wellington, Auckland.
NICARAGUA—Managua.
NORWAY—Oslo.
PAKISTAN—Karachi.
PANAMA—Panamá City.
PARAGUAY—Asunción.
PERU—Lima.
PORTUGAL—Lisbon.
PUERTO RICO—Ponce, San Juan.
REPUBLIC OF INDONESIA—Djakarta, Surabaja, Medan, Palembang, Bandoeng, Semarang, Makassar.
REPUBLIC OF THE PHILIPPINES—Bacalod City, Cebú, Manila, Negros Occidental.
SARAWAK—Kuching, Sibu, Miri.
SINGAPORE—Singapore.
SOUTH AFRICA—Johannesburg.
SPAIN—Madrid.
SURINAM—Nieuw-Nickerie, Paramaribo.
SWEDEN—Stockholm.
TAIWAN—(FORMOSA)—Taipei.
TANGANYIKA—Dar es Salaam.
THAILAND—Bangkok.
TRINIDAD—Port of Spain.
TURKEY—Istanbul.
VENEZUELA—Caracas

ALLIS-CHALMERS MANUFACTURING COMPANY, Industries Group, Export Department, Milwaukee 1, Wisconsin, U. S. A. Factories in U. S. A., England and Canada.

THE ATOM promises cheap power—but no commercial power plants have yet been built. There is criticism of U. S. atomic foreign policy, and business men ask:

Why a Delay in "Atoms-for-Peace?"

LOOK back just three years. On December 8, 1953, the President of the United States launched his "atoms for peace" program. He called for an international atomic energy agency, and pledged U. S. leadership in world atomic development.

His proposal opened a rift in the fear and mutual suspicion that had always surrounded the atom. And it encouraged dreams of rapid economic development by peoples everywhere.

What has happened since? Here, MANAGEMENT DIGEST presents a brief assessment of the successes, and failures, of the American atoms-for-peace program.

One fact stands out: The U.S.A. is far ahead of the U.S.S.R. and Britain, the only other major atomic powers, in the effort to encourage progress in nuclear energy around the world. To date, Washington has negotiated 32 bilateral treaties to help other nations with their nuclear research. It has concluded seven agreements for cooperation in the field of atomic power. Now new power treaties are being negotiated with Brazil, Norway, Italy, and Cuba.

President Eisenhower has also made available 20,000 kilograms of nuclear fuel to other nations, and has offered to pay up to $350,000 of the cost to foreign governments of each research reactor. Washington has also persisted in the diplomatic efforts to create an international atomic energy agency. Negotiations for that agency had entered the final stages as MANAGEMENT DIGEST went to press.

Yet despite this activity, there is mounting criticism of the American program, both in the U.S.A. and abroad.

There are many who insist that the program is slow, halting, and confused. They blame bureaucratic uncertainty, the Atomic Energy Commission's habits of secrecy, domestic U. S. politics, lack of continuing leadership and initiative. The U.S.A., these critics say, should right now be building atomic power plants in other nations.

There is much to be said for the critics. Of the seven power treaties, only three—with the United Kingdom, Canada, and Belgium—have been implemented. And less than half a dozen of the research reactors have been contracted for under the research agreements. Private American companies, anxious to build reactors overseas, are confused—and so are foreign governments and businessmen.

Of course there are major technical reasons for the lag in construction of atomic power plants. The nuclear power industry is still in its research and development stage: Not one large-scale commercial power reactor has been built. No one has any concrete ideas of cost. Indeed, many experts say that it makes no sense to talk today about what atomic power will cost tomorrow. The data is just not available.

During this "twilight" period, installation costs, comparative operating costs, the reliability of different types of systems, the risk to public health and safety—these and many other factors essential for sound planning are difficult to calculate.

This kind of thinking is common in the U.S.A. Nuclear power will be barely competitive in the U.S.A., comparatively rich in power resources, for a decade ahead. So the tendency in America is to experiment with reactors—moving slowly, rather than rushing ahead with a large atomic power program. Many atomic specialists ask "how can we help build plants in other nations if we do not know how they will work at home?"

To this the critics say: Even some of today's fairly primitive reactors can be useful in some areas of the world. And how else can the U.S.A., and other nations, gain the experience necessary unless they build operating power reactors? For the sake of nuclear progress, and to maintain American atomic leadership, the government ought to encourage private corporations to go abroad—right now—and start producing atomic power.

Yet many restrictions stand in their way. Despite the progress made since last year's Geneva Atomic Conference, U. S. secrecy still hampers access of foreign as well as American nuclear technicians to vital information. Further, the Atomic Energy Commission still has not worked out export price schedules for nuclear fuels. And its policy on the availability, for years ahead, of nuclear fuels overseas is vague. That worries foreign governments trying to plan a long-term nuclear power scheme, and worries private corporations who want to assist them.

Look at the case of American & Foreign Power Corp. This U. S. power company operating in Latin America has bought two small power reactors, and is about to order another one, for use in several of the nations where it operates. Yet it cannot announce where

"The World Bank is now determined to play an important technical and financial role."

or when the reactors will be working. That is because no Latin American country has yet worked out a bilateral power treaty with the U.S.A. U.S. secrecy regulations also trouble the company, and so does the matter of fuel supply. The company wonders what kind of assurances it will get as to power rates and fuel, for example, in a government-to-government agreement. It worries about the insurance requirements.

The company, like many others, is anxious to begin application of nuclear power in nations where it operates. It knows that present reactors may not be economic. Yet it wants to gain experience—and a strong position in the market.

Despite its troubles, American & Foreign Power sees progress being made in Washington. There are powerful forces pushing the U.S.A. toward a bolder program.

At home, the growing atomic power equipment industry is chafing to enter foreign markets on a large scale, and bringing pressure on the government. Also, there is a growing conviction among the American people that the U.S. can benefit from a wider sharing of atomic knowledge and wealth.

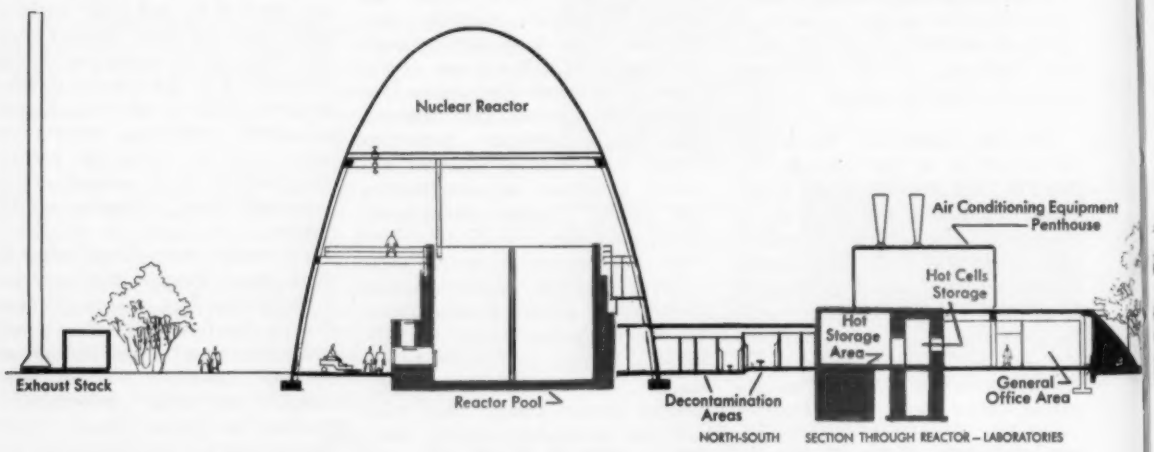
Abroad, the pressure for rapid power expansion is compelling. Less developed nations see atomic power as the key to defeating poverty. Power-short Europe is increasingly worried about its fuel resources. The threat to Europe's oil lifeline, Suez, heightens this sense of urgency.

One factor that will help determine the vigor of the American program is the speed with which foreign nations develop their own nuclear programs, individually or in concert. Europe now seems to be moving toward "Euratom," joining the six nations of the European Coal & Steel Community into an atomic program. Further, the proposed international atomic energy agency, which Washington hopes will be operating next summer, may play a catalytic role. Potentially it could have wide powers to exchange information, build and finance reactors, distribute fuels.

The World Bank is now determined to plan an important technical and financial role. This was made clear at the Bank's annual meeting in Washington. Some 36% of the Bank's loans have been in the electrical power field—so it is natural for the Bank to help finance nuclear power projects as soon as they are feasible.

All these, and other influences, are likely to put more energy behind the American, and the world, atomic power program. But any businessman looking ahead to the day of cheap nuclear power must keep two things in mind.

First, governments are going to continue to play the dominant role



Industry Builds an "Atomic Cooperative"

Atomic research in private industry has taken a giant step in the U.S.A. Ten manufacturers, for years trying to evaluate the impact of the atom on their products and processes, will now get the first chance to begin nuclear research programming of their own.

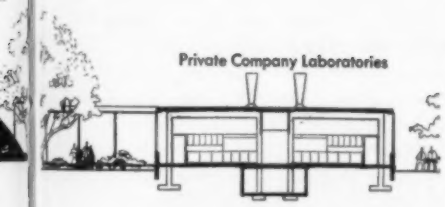
The approach is a cooperative one. The buildings above, built around a "swimming pool" research reactor, will be the exclusive domain of a machinery maker, a tobacco company, and glass, chemical, electronics, container, oil, and rubber companies. They will share the costs of the reactor, decide together how to use it—yet carry on individual research in their own laboratories.

The research center, first of its kind in the world, will be built in New Jersey, not far from New York City; it should be ready early in 1958. The sponsor of the project is American Machine & Foundry Corp. AMF recognized that the cost of reactors (the one above will cost over $1.5-million), laboratories, personnel, and all the the other impedimenta of nuclear research, was too high for any one company. Hence the cooperative.

The idea was a good one. The government's atomic authorities agreed, and several score of companies sought to join. The final members, besides AMF, are American Tobacco Co., Atlas Powder

in nuclear development, even if they would rather turn the job over to private business. The military and public health considerations make this inevitable. And when you deal with government, you must expect restrictions.

Second, a more realistic and practical approach to atomic power in many places will speed sound development. Writing in the American journal *Foreign Affairs*, a distinguished nuclear scientist points out that nuclear power of itself is not the panacea that will bring prosperity for all. Indeed, he asks if "cheap power" is so essential after all. The Delaware Valley of the U.S.A. is in the midst of industrial boom, yet it is not a "low-cost power area." Japan can be a very effective competitor in international markets, yet its power costs are very high. The Middle East has been supplying half the world with oil for a generation, yet it does not have an industrial plant and high living standards based on "cheap power." ●



Co., Continental Can Co., Corning Glass Works, National Distillers Products Corp., National Lead Co., Radio Corp. of America, Socony Mobil Oil Co., and U.S. Rubber Co.

Each of the 10 are planning research now. Their interests cover fields like food preservation (sterilizing, preserving, packaging—with radiation); production control (using radiation to monitor processes); plastics and synthetics production (new methods, new synthetics); agricultural and medical research. (Digested from BUSINESS WEEK, Sep 8, p110)

Keeping Prices Stable . . .

. . . won't be easy for the Tin Council. Nor is the future bright for other commodity pacts—for coffee, or rice. Much depends on U. S. policy.

Digested from BUSINESS WEEK, Sep 8, p177

This month, the International Tin Agreement is at last ready for business. The first deposits of money from the six major tin producers have given the 19-member Tin Council real assets. Now, the Council can begin its effort to prevent wide fluctuations in tin prices.

Businessmen throughout the world are carefully watching this newest version of the commodity stabilization pact. Nearly every raw material producing nation has wanted a stabilization scheme for one commodity or another. And among the consuming nations, rapid industrial growth has prompted demands for a growing supply of primary products—at reasonable prices.

So all eyes are on tin, and on Mr. W. K. Davey of London, who will manage the Tin Council operations.

By next March, Davey should have around $25-million, contributed by Malaya, Indonesia, Nigeria, Bolivia, Thailand, and the Belgian Congo. These producers had the alternative of depositing 15,000 tons of metal, or the money equivalent at 80 cents a pound. Because prices have been high ($1.03 in early October), they preferred to send the money.

Davey will use these funds to buy tin when prices drop, in an attempt to keep tin from falling to the base price of 80 cents. If tin should climb to the top limit of $1.10, Davey is supposed to sell tin from Council stocks to push prices down.

This, at least, is what the Tin Agreement states that Davey is to do. But there are always problems.

One of the biggest buyers of tin, the U.S.A.'s strategic reserve stockpile, has almost completely stopped buying. A surplus is building up. With this $25-million fund, the Tin Council hopes it can buy and keep enough of this surplus to prevent prices from falling too fast.

But suppose prices rise, and approach the top limit of $1.10. Here the Council is supposed to sell metal. And here is where the tin producers will put extreme pressure on the Council in an effort to keep prices high—something the 13 consuming members of the pact will not like to see. Such a situation puts severe strains on any pact.

Since the war, world business has had some experience with two commodity agreements—covering wheat and sugar. After the tin agreement is functioning, there may be pacts organized for olive oil, jute, rubber.

Each commodity agreement uses different methods to achieve the same goal: keeping commodity prices within a certain range. The International Wheat Agreement's 40 members (six exporters, 34 importers) do this through agreements between producers and consumers to buy and sell wheat among themselves at from $1.50 a bushel to $2 a bushel. But since the six exporters produce only 32% of the world's wheat, the agreement has not been completely effective. Also, the largest wheat importer, Britain, has quit the agreement.

The International Sugar Agreement (15 exporters, 8 importers) tries to keep sugar prices between 3.25 cents a pound and 4.35 cents by a system of export quotas imposed on producers. The pact covers 81% of all sugar exports, and has been more effective than the wheat agreement. But it too is having some severe troubles.

Both the wheat and sugar pacts have the U.S.A. as a member. But that does not mean that the U. S. believes in commodity schemes.

Many Americans dislike the interference in trade, the government intervention, that comes with a commodity pact. Washington's experts on foreign economic policy have generally agreed. On their advice, the U. S. refused to join a coffee pact, has resisted a rubber

treaty, and has given only tacit support to the tin agreement. Note that in each of these pacts, the U.S.A. would be a consumer member. Significantly, where the U.S.A. is also a producer (as in wheat), or a producer and importer (in sugar), it has joined.

Now, some groups in the U.S.A. are urging that the government support and join more pacts. These opinions usually come from economists, plus large wheat, cotton, and rice producers. Economists from several United Nations agencies also urge commodity pacts on the U. S. One U. N. study attempts to prove that less-developed, raw material-producing nations would receive no benefit from the economic help they get each year if prices of their products fell 5% in that year.

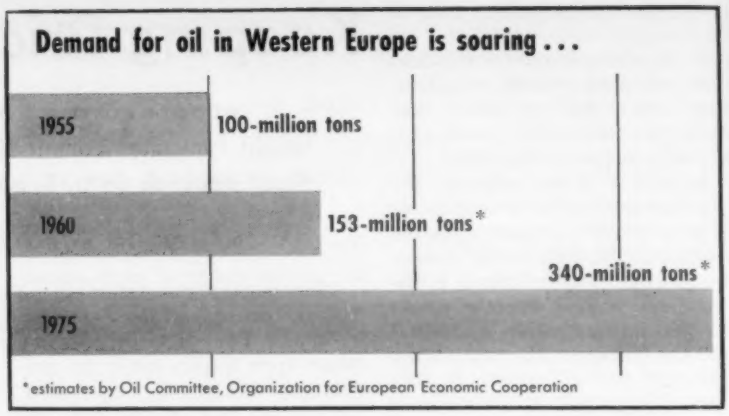
Statistics like these are used to support the claim that it would be cheaper, and frequently more effective, for the U. S. to promote commodity price stabilization than to pour out more economic aid to raw material producers.

Coffee is a striking example of Washington's problem. As the world's largest coffee drinker, the U. S. wants low prices. But the U.S.A. is vitally interested in Latin American prosperity.

When Latin American nations wanting to form a coffee pact asked for U. S. support last year, Washington was studying reports that forecast a tremendous coffee surplus by 1958 or 1959. So the U. S. had to decide: What is better for our interests—lower coffee prices, or the risk of an economic and political upset in Latin America if prices were to fall by 50%?

The U. S. rejected the pact. But today, the feeling is strong among some of Washington's Latin American specialists that if prices were to fall sharply, the U. S. might help support a coffee agreement.

Remember that domestic politics strongly influence U.S. attitudes toward commodity schemes. The housewife demands reasonably-priced coffee from Latin America. The U. S. farmer insists on high prices for his own products. And the U.S.A.'s own domestic farm price stabilization programs—and the big surpluses they have produced—complicate the outlook for international commodity plans. ●



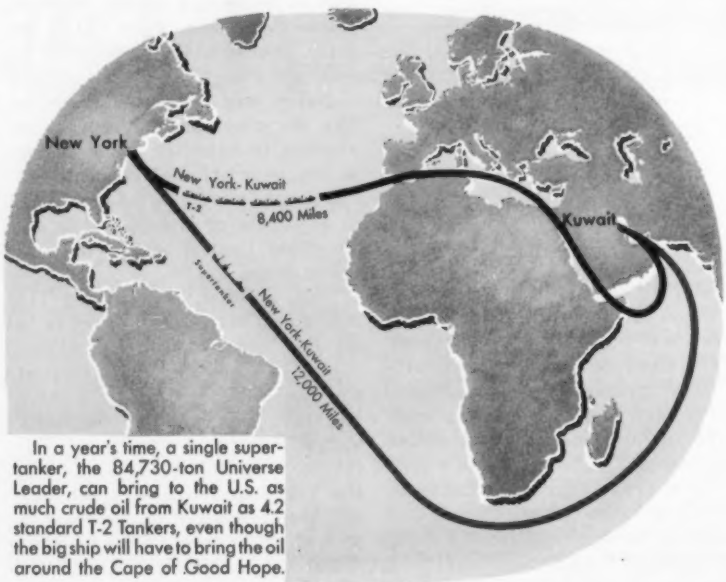
Future oil needs in Europe and elsewhere require . . .

Giant Tanker: New Queen

Recently, an unprecedented 51,000 tons of oil were delivered at Santos, Brazil, by one giant ship. But, starting this month, world business will see even larger bulk cargoes. The huge, Japan-built Universe Leader, 84,730 deadweight tons, begins service under charter to an American oil company. Though not as large as Britain's two "Queens," the S.S. United States, or France's Liberte, Universe Leader is by far the most ponderous cargo craft ever built, able to carry 707,320 barrels of oil in her big tanks.

And she is just one of a 70-ship flotilla of "super" tankers over 40,000 dwt. now planned or on the ways of world shipyards. One of them, a project of Greek shipowner Aristotle Onassis, is expected to have a capacity of 100,500 tons.

What has happened is this: The tanker is becoming the "Queen of the Seas." Oil is the one dynamic element in ocean-borne trade; in 30 years oil has risen from 13% of total sea trade to 45%. Growth in shipping for the next few decades depends—as do so many other industries—on oil.



In a year's time, a single supertanker, the 84,730-ton Universe Leader, can bring to the U.S. as much crude oil from Kuwait as 4.2 standard T-2 Tankers, even though the big ship will have to bring the oil around the Cape of Good Hope.

Universe Leader: Largest Tanker*

Cargo capacity: 84,730 tons

** Length: 255 meters; beam 37.5 m.; draft: 13.8; speed: 14 knots; crew: 50*

Proposed Super Tanker*

Cargo capacity: 100,500 tons

** Length: 280 meters; beam 40.5 m.; draft: 14.4 m.; speed: 16 knots; crew: 70*

. . . huge tankers like this today . . . and the construction of even larger ships tomorrow.

of the Seas

• The world's demand for oil seems insatiable. It seems that every few months new, larger estimates of future oil needs are made by economists and businessmen (see chart, above).

• Because the largest users of oil are usually far from the source of supply, the tanker is indispensable. The U.S., Venezuela, and the Middle East are the major sources of oil. And for most users, they are accessible only by ship.

This is the background against which the Suez Canal crisis appears. The problem of moving enough oil by water was not caused by Suez—but the crisis has made the problem seem more urgent. Shipbuilders, and the industries that serve shipbuilders, are already very busy in most nations. Now they are wondering how to produce more, and larger, tankers—tankers that could if necessary make up for a halt, or a slowdown, of canal traffic by carrying large quantities of oil around the tip of Africa.

If the world should want giant tankers in a hurry, it will face the problem of shipbuilding capacity. The present tanker fleet is fully employed, and the oil industry is anxiously awaiting those ships now being built. In most major shipbuilding nations, yards are booked way ahead, and have had to extend delivery dates. Costs are rising, and most yards have abandoned fixed-price contracts.

One place where capacity is not fully employed is in the U.S.A.'s relatively high-cost shipbuilding industry. Cost per deadweight ton —averaged over the past few years —comes to about $300, compared to $200 in Europe and a bit less in Japan.

Nonetheless, Washington has given serious consideration to an emergency program for building as many as 100 giant tankers in the 85,000 ton—100,000-ton range. If the Suez situation required it, the first such tanker could be produced in 10 months, with other launchings every two or three months. Any such project would, of course, require subsidies.

And even if the Suez problem is settled—and the canal continues as the world's chief oil highway—many oil men think giant tanker construction should be encouraged, though not at emergency speed. While many of the smaller, more flexible tankers will be produced in the years ahead, the emphasis in industry thinking is on bigness.

In terms of basic economics—what a tanker costs and what it earns—the bigger it is, the more efficient it is for long hauls of oil. If tanker rates were the same for all sizes, if there were no problems of channel depths and berthing facilities, ship operators say they would like to see tankers 8 kilometers long. That is because building costs per deadweight ton decline with size, and new requirements of engine size do not increase in the same ratio as carrying capacity—nor do fuel consumption and crew costs.

In terms of speed and cargo capacity, the new Universe Leader is the equivalent of 4.2 of the 16,000 ton T-2 tankers developed during World War II. It can carry 707,320 barrels from the Persian Gulf around Africa to Europe in 30 days, to Brazil in 22 days, to New York in 33 days. The T-2 can carry 141,158 barrels—through the canal—to New York in 24 days.

The "super" tankers do present problems. The Suez Canal draft limit is around 40,000 tons; at 65,000 tons, tankers are so large that they cannot pass Panama Canal locks. Even more limiting is the lack of channels, berthing, loading, drydocks large enough.

The problem of facilities is so serious that it will be a major topic for discussion at the 1957 Congress of the International Association of Navigation.

One unique approach to the problem of giant tankers is being studied now. The idea is to build several "super" oil storage terminals at important points in the world, to serve a number of nations and refineries simultaneously. An oil tank farm would be built on land, into which the giant tankers would discharge their cargoes through underwater unloading lines. The oil could then be distributed to smaller tankers, or through a land pipeline system.

At the start, four terminals might be built—on the U.S. West and East coasts, in Britain, and the European continent.●

Compiled from reports by The Economist, Business Week, Petroleum Week, Petroleum Press Service.

GIANT BULLDOZER clears jungle land in part of a program that means . . .

More Farm Land for Peru

Digested from THE TIMES REVIEW OF INDUSTRY, Sept, p 101

Peru's program to increase its farm lands is making important progress. Indeed, Peru's experience may be valuable to businessmen and governments of other tropical, or subtropical, areas.

Like others among its South American neighbors, Peru today cultivates less than 2% of its total land area. And it must import large quantities of food—as well as export agricultural products. So Peruvians are hard at work (1) increasing the yield of areas already under cultivation, and (2) bringing virgin land to the plow.

The first part of the plan is to increase the efficiency of the natural irrigation on the western Andean slopes; the second is to divert waters from the eastern slopes to the western Pacific Coast rivers, and the third is to clear new land in the Amazon region.

The program is based on the geography of the land. The high Andes form the Peruvian watershed. Although close to the Pacific coast, the eastern slopes feed into the Amazon system—and only the western slopes are irrigating Peru's farm land.

To save water available during the flood season, reservoirs are being built. They will help provide 100,000 hectares in the cotton areas of northern Peru by 1958. From an engineer's viewpoint, this is the relatively easy part of the program.

More remarkable—and difficult—are two schemes to tap the waters of the eastern slopes, and send them westward.

The $2-million Chotano-Chancay project: From the Chotano valley, over 1,950 meters above sea level, a 4,550 meter tunnel will divert water to the Pacific coast. Shorter tunnels and canals will carry the water to a reservoir, which will regulate water flow into the rich sugar-growing region of the Chiclayo valley. The project is near completion—and will water 60,000 hectares.

The $10-million Choclococha diversion is from two lakes at a higher altitude—over 4,500 meters. An engineering feat in itself was bringing $2-million worth of heavy equipment to this almost inaccessible area. At 3,900 meters, a canal will pass beneath the main watershed to divert water from two lakes. Some 48 kilometers of canal, and 9,100 meters of tunnel, are being built. A small dam will store water borrowed from a river emptying into the Amazon system, and sent it to a river bound to the Pacific coast.

The diversion will improve irrigation of 24,000 hectares, now mostly planted to cotton, and open new land as well.

Of perhaps greater potential to Peru—and other nations—is the LeTourneau colonization project on the eastern, Amazon slope of Peru. The forest, or "selva," of the Amazon basin covers two-thirds of the nation. If LeTourneau's machines and methods work, vast Amazon forest areas may some day become agricultural land.

The project is completely a private business venture. In exchange for building a 49-kilometer road from the Trans-Andean Highway into the region, Robert G. LeTourneau, U.S. manufacturer of heavy construction equipment, was given a concession to exploit 400,000 hectares of jungle land. Last month, the preliminary road was almost complete. The first 60,000 hectares have been selected, and clearing is well advanced. A permanent village—Tournavista—has been set up.

With free land available elsewhere in Peru, the LeTourneau projects will probably attract large-scale plantation and ranching operations rather than individual farmers. A lumber mill has already started, and LeTourneau is trying to develop crops and methods that will not ruin the cleared land. One of the great problems in reclaiming the jungle has been the short span of the soil fertility.

The LeTourneau project is of great interest because of the revolutionary land-clearing equipment developed by LeTourneau.

1. The **"tree-roller"** (weighing about 110 tons) uproots smaller trees, crushes underbrush. 2. The **"tree-crusher"** is a larger (150 tons) version of the first. It pushes over, and uproots all but the largest trees—using huge drums set with knives and a horizontal pushing bar. 3. There is a **"tree stinger,"** a special tractor with a steel boom which can push over large trees and uproot them with several blows at a point above the tree base. 4. Another is the **"tree-crasher"**—mounted on six wheels with 3-meter tires, weighing over 100 tons. It pushes trees over, like a bull dozer, with a shield 4.5-meters wide. 5. Finally, LeTourneau has designed a mechanized **giant plow**—with 1.8-meter discs.●

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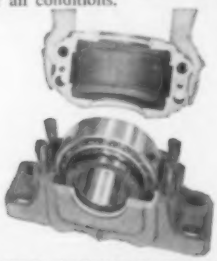

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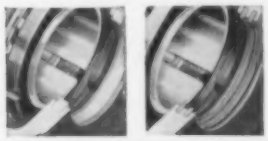

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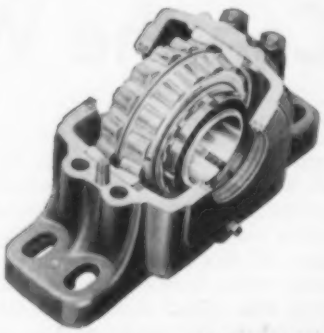

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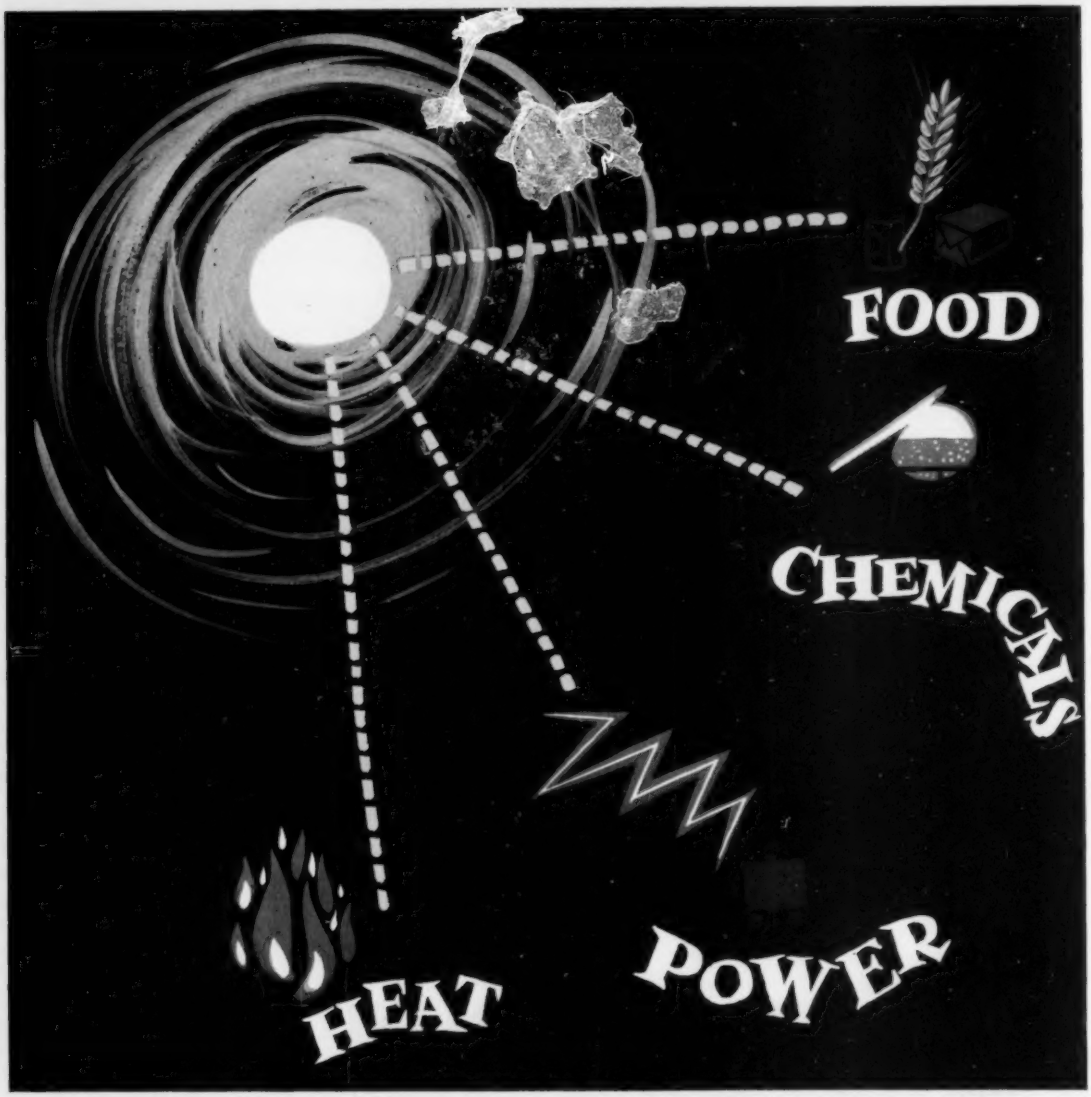

Can the World Use an Unlimited Su

Digested from CHEMICAL ENGINEERING, Sept, p175

Whenever businessmen and scientists gather to discuss the world's rapidly increasing need for power, talk eventually gets around to the ultimate energy source: the sun. Of all the energy sources—coal, wood, oil, rushing water, and even the fabled atom—only the sun offers an unlimited energy supply.

And while the world is busy enough working on atomic power, a great deal of research has centered around the sun. The fruits of this research are just now appearing. Indeed, man's three decades of studying the atom have advanced our knowledge of the sun.

One way of studying the sun's potential and what it may mean to businessmen now or in the future is to break down utilization of solar energy into these four fields: (1) heat, (2) power, (3) separation of chemicals and (4) growing food.

I. Heat from the Sun

Comfort heating of homes and other buildings will probably make up the largest single application of solar energy. Over one-third of all the world's energy ends in this application. Considerable fundamental work is being done in this area; and experimental sun-pow-

SOLAR ENGINE was built by Societa Motori Recuperi, Italy.

CHEMICALS come from sea water evaporated by sun's heat.

d Supply of Energy?

ered home heaters have been built. But, still solar heating appears to be a long way from factory-produced units.

In the long-range future, solar energy may provide process heat in the manufacture of chemicals. But first the conventional fuels will have to become very scarce.

II. Solar Energy for Power

One of the early prospects for useful solar energy consists of small sun-powered units of only a few horsepower. They would be useful in isolated areas or small communities for water pumping and lighting. The greatest need now is for technical progress in energy storage and in heat engines. (See picture above)

The direct conversion of solar energy to electricity is another early possibility. But as of now, it appears to be limited to uses requiring only small amounts of power. The "solar battery" developed by Bell Laboratories in the U.S.A. should find applications in communications systems, where energy needs are small, and in locations where other power sources are unavailable.

Thermoelectric effects, such as produced in a thermocouple (application of heat to the joint of two dissimilar metals produces a small amount of electricity), are long-range possibilities.

Right now, the sun's variability and the large collector area required make the use of solar energy for central station power generation unattractive. A typical area, for example in central Spain, would require a solar collecting area of about 8 sq. kilometers to supply heat for a 100,000 kw. power plant. Furthermore, some means for storing a portion of the day-time heat supply or power output for night-time use would have to be provided. In rough figures, the cost would be $100-million.

III. Solar Energy for Chemicals

For centuries man has used the sun to evaporate small ponds of sea or brackish water. The object, of course, is the salt contained in the water. Little improvement in the process has been made through the years until just recently. One example of progress is in Israel. There engineers add dye to the water, and most of the sun's heat is absorbed by the water rather than reflected by the white salt under the water's surface. The salt yield has been increased as much as 40%.

The evaporation of salt water provides a means of making fresh water. The newest designs of solar evaporators are relatively simple. The sun's radiation is absorbed in a shallow basin containing salt water. The water evaporates slowly and condenses on air-cooled glass covering the basin. Distilled water is collected at the edge of the glass cover.

Under average solar conditions (in dry areas on the Peruvian deserts or in Saudi Arabia, for example) about 5 kilograms of water can be distilled from 1 sq. meter of land each day. The sun's energy costs nothing, so the initial investment and its amortization make up the principle expense of

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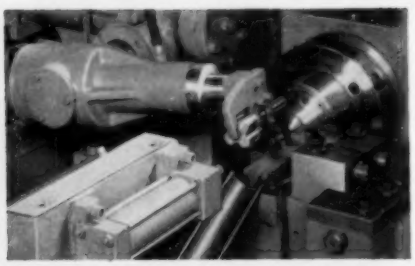

The loading arm is about to load the part into the chuck. After machining, part is ejected into chute in foreground.

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56-38

this operation. Simplified design and construction should bring the total investment below $10 per sq. meter and solar distilled water could be produced for less than $0.25 per cu. meter.

The sun's intermittent nature and the low efficiency of the machines used to convert its energy into usable power are the two formidable obstacles blocking the way toward efficient use of solar energy.

One possible approach is through the science of photochemistry. The problem is this: Find a chemical that will absorb most of the sun's energy as heat and then give it back as heat or power. Thus both obstacles are overcome; you have an efficient energy converter and energy storage.

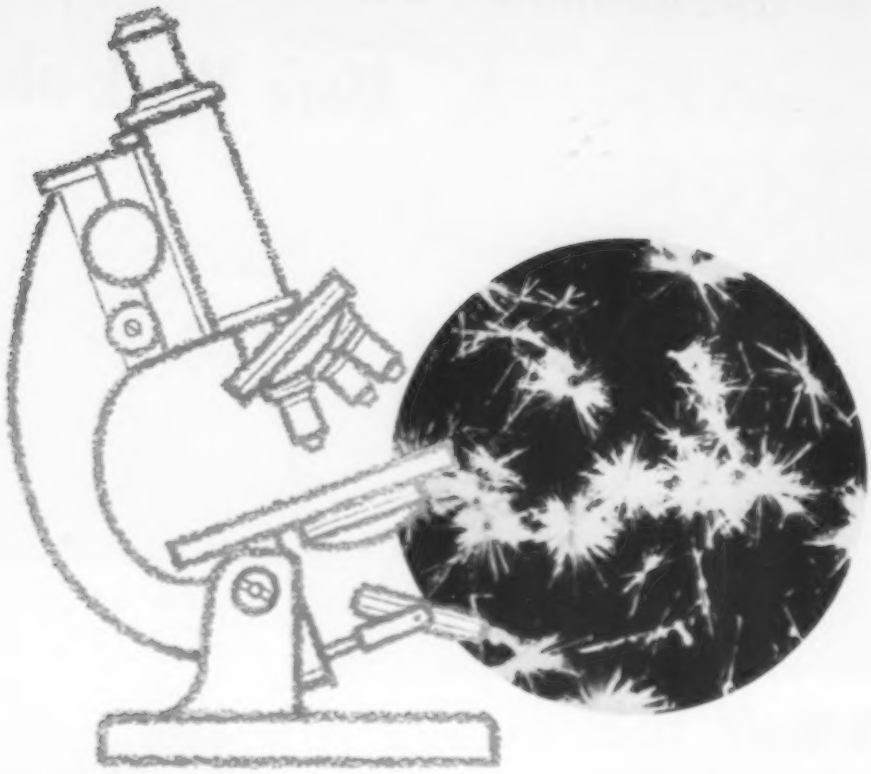
No chemical reactions have yet been accomplished at the necessary efficiencies. But some interesting avenues are open. For example, ultraviolet radiation (a component of the sun's light rays) will decompose water into hydrogen and oxygen in the presence of a catalyst. Efficiency is low, but continued research is justified.

IV. Solar Energy for Food

As world population continues its steady climb, the supply of food grown on the land for support of this population will become more critical. Algae, a simple water-borne plant, has important possibilities for feeding future populations.

The basic requirements for growing algae are simple. Algae-bearing water circulates through large basins exposed to the sun. Carbon dioxide and small amounts of inorganic nitrogen compounds are the only materials consumed. About 9 tons of dried algae can be produced per 1000 sq. meters each year under favorable conditions. Development work in Japan indicates possible improvements in this yield. Cost would be about $0.05 a kilogram.

Many years will be required in the further development of existing processes, reduction in costs, and biological improvement in algae strains. But there are parts of the world where the needs and opportunities for a cheap food source may someday exist.●



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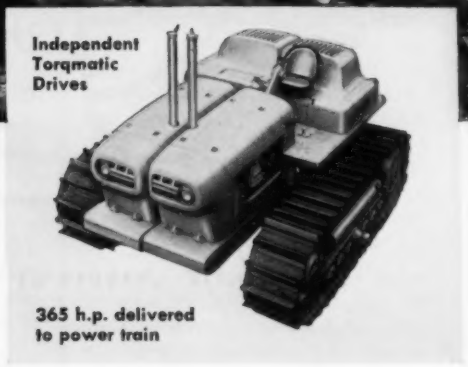

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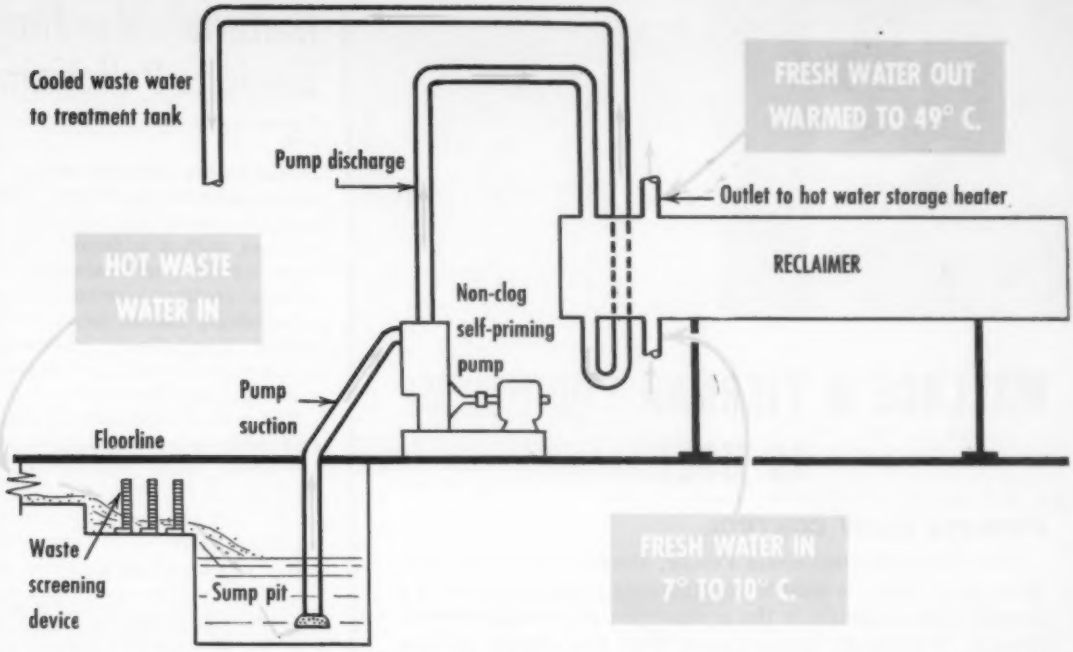


PLENTY OF HOT WATER all day long is the advantage of this reclaimer that salvages heat from dye-tub wastes, transfers it to incoming fresh-water supply. Reclaimer paid for itself in nine months by cutting fuel bills.

Save Money with Waste Hot Water

Digested from FACTORY MANAGEMENT & MAINTENANCE, Sept, p106

It costs nothing to heat cold fresh water with hot waste water by use of a heat reclaimer. This was the pleasant experience of Blue Ridge Textile Co. (Bangor, Pa.). When it installed a waste-heat reclaimer, the company:

- Saved 10% in annual fuel costs.
- Recovered the cost of the reclaimer in 9 months.
- Doubled the hot water output of an existing water storage heater.

It's an idea most plants that have hot process waste water might find useful.

Steam for process uses—principally for heating water used in dyeing tricot and other women's wear fabrics—is supplied at Blue Ridge by three boilers. These boilers supply steam to a water heater that holds hot water in storage at 83°C. for use in dye tubs.

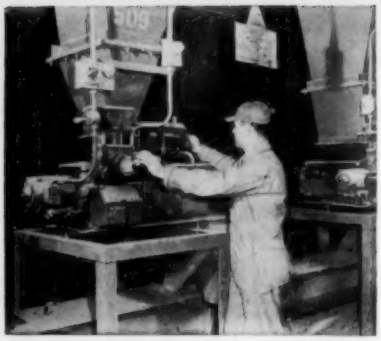
City water was first softened, then pumped to a 400-cu. m. storage tank. From here the water was drawn into a 19-cu. m. cement-lined water storage heater for use on demand in processing.

During peak loads the water heating system could not produce sufficient hot water. The boilers could generate more than enough steam, and the rated capacity of the storage heater was adequate. But the regulator valve of the heater could not deliver enough steam to keep the water temperature at 83°C. where it belonged for efficient operations. During peak loads, operators had to inject extra steam into the dye tubs in order to obtain correct tub temperatures.

This is only part of the story. Hot water obtained this way costs money. And Blue Ridge was pouring money down the sewer in wasted heat. After use in processing, the hot dye waste water was emptied into below-floor cement troughs leading into a sump pit. From here the waste water was pumped to two large wooden treating tanks for pollution treatment, and then discharged to city sewers.

Getting at the heart of the problem, Blue Ridge installed a heat reclaimer, which made possible some real savings and answered the valve problem as well. The reclaimer simply extracts much of the heat lost in the waste water, and transfers this heat to the incoming soft water supplying the storage heater.

There were some simple changes in soft-water and waste-water piping. Soft water now first passes from the soft-storage tank through the shell side of the new heat reclaimer. It enters the reclaimer at 7 to 10° C., and is raised to about 49°C. (at the rate of 1140 liters per minute.) From here it is pumped to the storage heater. The heater now has to raise the temperature only 16°C. instead of 40°C. as formerly. This lower demand obviously requires less steam, and accounts for the saving in fuel. After transferring much of its heat to the fresh soft water, the waste water continues to the treatment tanks as formerly.●



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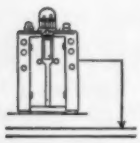
The W&T Merchen Scale Feeder, shown above at a large processing plant, is used to continuously weigh and feed dry free-flowing materials in the preparation of formulated compounds. Wallace & Tiernan equipment was chosen because of its dependability, adaptability, and high order of accuracy. These qualities are typical of the W&T line which includes chemical solution feeders, gravimetric and volumetric feeders, and gravimetric meters — all with definite application in process industries.



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E-103

Materials Handling: Guide to Palletizing

Digested from CHEMICAL WEEK, Sept 8, p69

Making the most efficient use of pallet space for transportation and warehousing always calls for a lot of work with a slide rule and a tape measure—not always with the best results. A recent study of palletizing problems conducted by the U.S. Navy's Bureau of Supplies and Accounts aims at eliminating much of this tedious job.

The study is intended as a general aid in improving warehousing practices. More specifically, it gives a new and simplified method of determining the most efficient loading pattern for any given container size on a standard-size pallet. Heart of the report is a collection of six master charts. They provide at-a-glance answers to problems of utilizing container sizes to get maximum economies in warehousing and transport of unit loads.

The charts are results of the Navy's tests of all known patterns for pallet loading. Of some 448 patterns, only 172 remained after all the duplicates, and those that were less than 80% efficient, were eliminated. These 172 (63 non-interlocking, 109 interlocking) are represented on the charts, cover approximately 20,000 container sizes in increments of ¼ inch with lengths from 6 to 52 inches and widths from 5 to 43 inches. The best pallet pattern for any size of container can be determined quickly by locating on the chart the intersection corresponding with the container lengths and widths.

Figuring 10% as the saving possible with more efficient palletizing, the study found the following space reductions are possible:

- **Warehousing**—an additional 900 tons and 60,000 cubic feet can be realized in a 200x600-foot warehouse, assuming a floor area utilization of 50%, a stacking height of 10 feet and an average density of 30 pounds per cubic foot.
- **Railroad boxcars**—an additional 3½ tons and 230 cubic feet can be realized in a 50-foot boxcar

with pallets loaded 2 high, 2 across and 13 along the length of the car, assuming an average net of 45 cubic feet per pallet and an average density of 30 pounds per cubic foot.

• **Highway trucks**—an additional 1,350 pounds and 45 cubic feet can be realized in a 24-foot highway truck loaded 2 pallets wide, 1 across and 5 along the length of the truck, assuming an average net of 45 cubic feet per pallet an an average density of 30 pounds per cubic feet.●

Copies of the study, "Container Size and Pallet Pattern Selection Criteria for Use on 40 x 48-inch Pallets," including six master charts, are available from the Office of Technical Services, U.S. Department of Commerce in Washington, D. C. Price is $3.00.

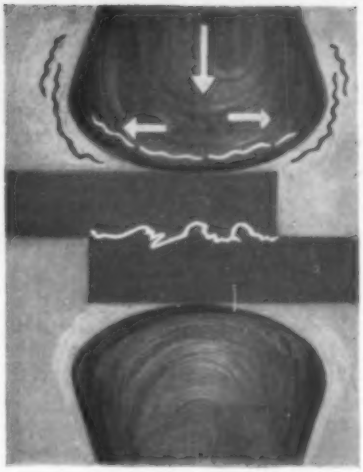
$25 Wheel Brings Turbine Auto Closer

In October 1955, Ford Motor Co. engineers said that one blade for an automobile gas-turbine wheel costs about $54. And they felt that the cost for the whole wheel would have to be about $25 before a turbine could compete with the standard reciprocating engine. But last year there were staggering problems in metallurgy.

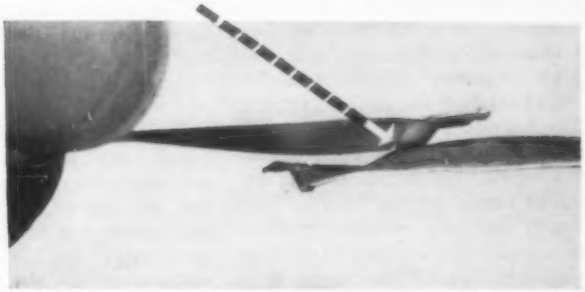
Now there are indications that these problems can be overcome. Another automaker (not Ford) is turning out a complete gas-turbine wheel for less than $25. And the company expects to bring that cost down to $10. The secret: investment casting. Cobalt and nickel alloys make up the $25 wheel, but the hoped-for $10 wheel will use no expensive metals.

One metallurgist says: "The efficiency of the gas-turbine right now has more potential than the efficiency of any projected reciprocating engine".

Despite this encouraging breakthrough, don't expect gas-turbine autos on the road tomorrow. The industry's prophets say it will probably be 1963-65 before gas-turbines are in general automotive use. That's because almost 100% retooling for the new engine would be needed. (*Digested from American Machinist, Sept.* 10, p101)



1 Ultrasonic vibrations from welding head pass through metal strips for several seconds, breaking up the interface between them.



2 Two thin strips are joined with a bond as strong as the base materials

Vibration Welds Metals

Digested from BUSINESS WEEK, Sept 8, p91

High frequency sound energy—ultrasonics—has solved a host of industrial problems in the last 10 years. It is a proven inspection device. It can speed mixing and chemical reactions, machine "impossible" materials such as diamonds and carbide, and is an excellent cleaning aid.

Last month Aeroprojects, Inc., (West Chester, Pa., U. S. A.) added a new use to the impressive list of industrial applications for ultrasonics. It is the first really new and different joining process to appear in a long time. It welds without melting, joins dissimilar or reactive metals, and does it with relatively little deformation of the pieces.

The ultrasonic process makes possible the welding of copper to aluminum—not now feasible. This will have important applications in the electrical field. Another use will be the welding of materials of foil-like thickness to heavy plates, rods, or tubes—something that was difficult to do with fusion-welding techniques.

Aeroprojects sees a promising future for the ultrasonic process in jewelry-type welding, such as in small precision switches and vacuum tube elements. Continuous-weld equipment, that could

hermetically seal foils for the packaging industry, is also under development.

But the process has definite limitations. Ultrasonic welding was developed to weld metals of the thickness of foil. Its range has been increased slowly, but the range is still measured in fractions of a centimeter.

High frequency sound can do this and other jobs for industry because it is basically just another means of transmitting energy in the form of vibrations. Ultrasonic tools are built around the use of vibrations that you cannot hear. Useful ultrasonic vibrations start where the high-fidelity radio speaker leaves off, ranging upwards from 20 kilocycles to 1,000 kilocycles.

Ultrasonic welding makes use of this ultrasonic vibratory energy to weld thin strips of metal. The two pieces of metal to be joined are clamped between two welding members, or "sonotrodes," and high frequency vibrations are induced through one of the clamping members (see p25). Metallurgists are not certain, but believe that the oscillatory motion that is induced breaks up the interface between the two metals, provides intermolecular contact—and thus makes the weld. The devices that actually produce ultrasonic vibrations are called transducers. They change electrical energy into the needed high frequency vibrations. There are two types: crystal, or piezoelectric, and magnetic. Crystals change size—and create vibrations—when current passes through them. Magnetostrictive metals change size when magnetized.

Aeroprojects has this word of warning concerning its new process: Engineers must keep in mind just what sizes of material ultrasonic welding can handle. The company talks only in terms of welding very thin pieces of metal (0.025 mm. to 0.625 mm.) to an opposing piece that does not usually exceed 2.5 cm. in thickness. Dissimilar metals can be welded, but must be in the same hardness range.

Continuing development work is slowly pushing up material thickness limits, but only about 0.150 mm. every six months.●

What Role for Steel In a Competitive Age?

Competition between steel and substitute materials will increase—but steel will remain dominant. Consumers can benefit from competition.

No one worries about steel losing its position as the leading primary material. But no one will deny that steel does have competitors.

The United Nations Economic Commission for Europe recently looked into the effects various materials have had—and will have—on the future of steel. Its new report, "Steel and its Alternatives," makes this conclusion: No more than 10% of steel's market will be lost to alternative materials. And the steel industry, particularly in Europe and the U.S.A., will hardly feel this competition while it continues to grow by expanding into new markets.

The competitors discussed in the report are aluminum, plastics, asbestos-cement, concrete, and timber. All can do some jobs better than steel; but none have steel's versatility. For instance, steel makes good fan blades but aluminum or plastics are lighter and may be easier to fabricate. But you would not make a fan shaft out of plastics.

The competing materials have a particular edge over steel in their corrosion resistance. And their lighter weight will permit lower installation costs. Maintenance costs are also likely to be less than that for steel, which corrodes, and needs continuing care.

Inroads in steel's market by competing materials show various degrees of success. Prestressed concrete and, to a lesser extent, aluminum have cut deeply into steel construction. In the automobile industry, aluminum and plastics are competitive though steel is far stronger and somewhat cheaper. Here light weight makes both these materials especially attractive. For commercial vehicles, aluminum and plastics offer the possibility of increasing the payload-to-vehicle weight ratio. In Europe you find a definite trend to lightweight materials for vehicles, partly because the more a vehicle weighs the higher is its tax.

Up to now plastics have been used very little in passenger-car bodies; but the advantages of their light weight, lower tooling costs, and ability to form complex shapes are clearly substantial. What is needed are more competitive prices for plastics.

In shipbuilding you will find more and more aluminum replacing steel in the superstructure of new ships. Corrosion resistance and light weight are again the big factors here. Small boats have been made of plastics. This trend is likely to continue also.

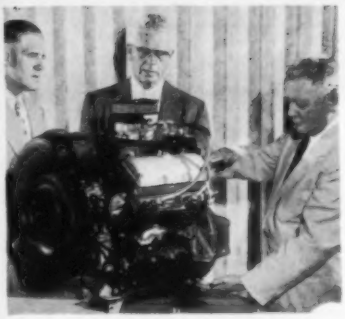
Already, there are dramatic signs of plastics competition with steel in the tube and pipe industry. The use of plastic tubes and pipes is growing rapidly; and new markets are developing. In the U.S., at at least, the steel industry sees the potential of plastics—and some steel companies are making plastic tubes and pipes.

The ECE report emphasizes that it is impossible to tell how much steel is actually being replaced by competing materials. But it is clear that material research and development is bound to threaten steel's supremacy in some fields.

Steel will surely battle its competitors, says the ECE. But the report chides the steel industry, says it must put more effort into its development programs. Out of this, the report points out, the consumer will benefit. Lower prices and better products will result.●

Copies of the report, "Steel and its Alternatives," are available from Sales Section, United Nations, Palais des Nations, Geneva, Switzerland, or may be ordered through Sales Agents for United Nations publications. Price is 2.50 Swiss francs or equivalent.

Looking Ahead in Technology



COMING: a small U.S. car? American Motors Corp. has revealed an air-cooled 100-kilogram, V-4 engine (above). The 62-horsepower engine has individually die-cast aluminum cylinders, with chrome-plated bores.

Detroit experts speculate that the U.S. market is ready for the introduction of a popular made-in-America small car. Volkswagen's success (VW will sell nearly 60,000 cars in the U.S. this year) has helped point the way. Now there is talk that AMC's new engine may power a U.S.-made small car. (*Product Engineering, Sept, p*213)

●

RADIO in helmet permits combat soldier to report to headquarters. Transistor powered, the radio was developed by U.S. Signal Corps Engineering Laboratories. It weighs less than a half a kilogram and fits into a special helmet. (*Electronics, Sept, p*236)

"AMAZING grinding machine plant." That was the reaction of a recent visitor to the Karl Jung plant in Goeppingen, Germany. The visitor called it "unique" because it had been built to operate almost automatically to produce just one machine—the Karl Jung surface grinder. These were some of the ideas observed by the visitor:

- Every machine in the plant is replaced with a new model when it becomes 5 years old.
- Subassemblies are put together by operators seated at individual tables, each with drawers and shelves for parts.
- All machines are operated at predetermined optimium feeds and speeds, and employ modern high-production cutting tools.
- Snagging of castings is eliminated by shotblast.
- Hot paint or lacquer is used to spray-finish machine bases and other painted parts. This eliminates thinners and speeds drying, requires less paint, and produces a superior finish. (*American Machinist, Sept* 24, *p*170)

●

RUSSIA says it will build the world's first solar power station. It is planned for construction in the Ararat Plains of Armenia S.S.R., which has the highest rate of sunshine and the greatest amount of heat transmitted by the sun in the U.S.S.R.

The station, which will serve local industry, will have 1,293 mirrors. These mirrors, mounted on special carriages, will move about on 23 railroad tracks constructed around a tower like spokes in a wheel. Reflected sunlight will be aimed at a steam boiler. For more information about the sun's energy, see page 18. (*Electrical World, Sept* 17, *p*129)

●

FRENCH LINER will be atom-convertible. The French Line has disclosed plans for a 30-knot, 55,000-ton passenger ship to be named France. Engine rooms are designed so that the ship's eight boilers could be removed and replaced by reactors if nuclear power should become economic.

Japan also plans nuclear-powered ships. The Transportation Ministry has drafted plans for completion of two nuclear-powered ships by 1966. Propulsion plants are to be 20,000 or 30,000 horsepower. One will be imported, the other built in Japan. Basic research program is to be launched next year and a research reactor built or imported within 5 years. (*Nucleonics, Sept, pR*11)

●

ENCYCLOPEDIA of science and technology is planned in the U.S.A. A 3-year project will result in a 10-volume, 7,000-page compendium of scientific and technological information. Articles will present progressive development of the subjects from general to specific data. The publishers, McGraw-Hill Book Co., plan to revise the encyclopedia annually. (*Business Week, Sept* 15, *p*55)

●

PRODUCTION BRIEFS: The world's first commercial pipeline for transporting coal has just been completed. It is 176 kilometers long and can move coal, crushed and mixed with water, at a rate of 150 tons an hour. Coal will be burned to generate steam for an electric utility. The owners, Pittsburgh Consolidation Coal Co., of the U.S.A., expect the line to be in production early next year.

Salk anti-poliomyelitis vaccine will be ready for larger exports soon. (*Chemical Week, Sept* 8, *p*42)

Bearing balls are rolled instead of pressed by Russian technicians. Hot steel rods are fed through threaded rollers. Thread height increases along roller; and threads have a semi-circular shape. Last thread on rollers pinch off semi-finished ball. (*McGraw-Hill World News*)

Forging molybdenum in argon atmospheres has led the U.S.A.'s Universal Cyclops Steel Co. up some unusual roads. Atmosphere problem may be solved by putting up a sealed building that will hold argon. Operators would wear suits similar to an underwater diver. (*American Machinist, Sept.* 24, *p*101)

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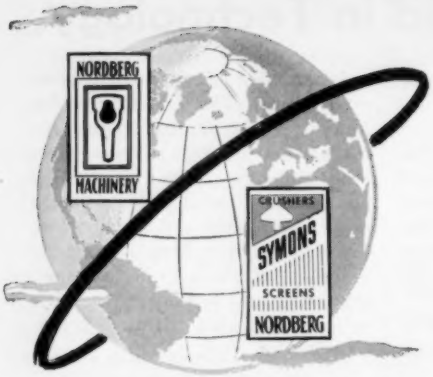

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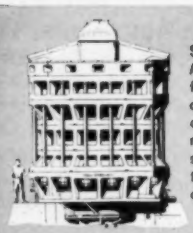

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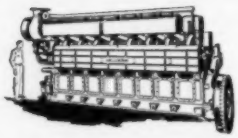

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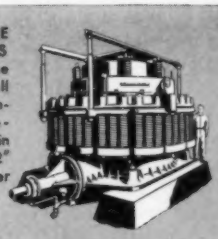

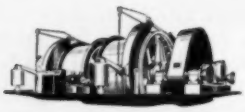

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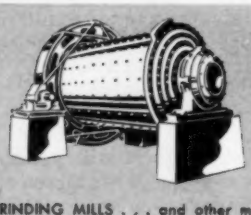

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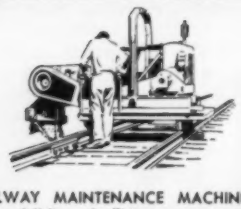

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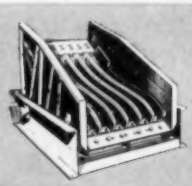

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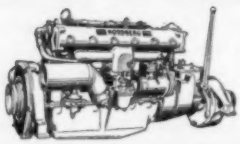

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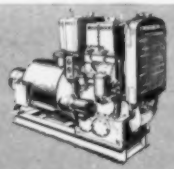

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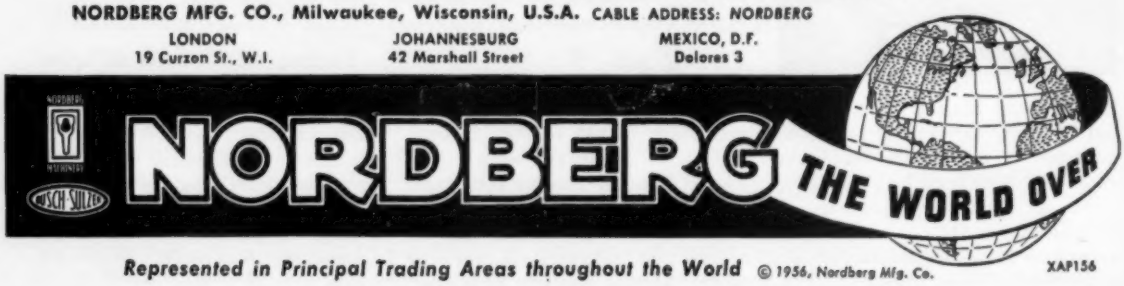

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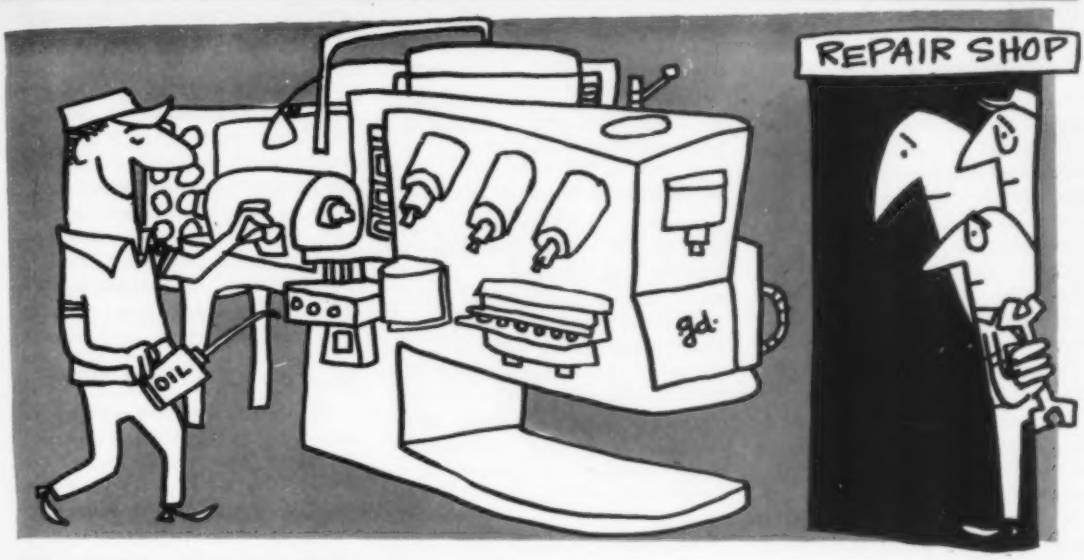


PLAN PREVENTIVE MAINTENANCE FOR . . .

Less Downtime—Less Cost

Digested from FACTORY MANAGEMENT & MAINTENANCE, Special Report, Sept

Plant managers are placing ever greater faith in the old adage, "An ounce of prevention is worth a pound of cure." They are concentrating on planned preventive maintenance—with the great emphasis on planning.

"PM" plans—organized in formal fashion just like any regular unit of factory operation—are the fastest growing trend among cost-conscious shop managers these days. The motive is simple: less machine downtime (for heavy maintenance and repair) will mean less cost for each unit of production.

PM is a growing concept. Many executives still think of it only in terms of periodic inspection of equipment to prevent breakdowns. To this limited view others add repetitive servicing, upkeep, overhaul. Still others include plant and worker protective equipment. And there are those who expand the idea even more—they study carefully the workings and "habits" of all equipment before it is installed. Good PM, they say, begins with proper selection and installation.

There are a few executives who even apply the PM concept to any activity that will not only prevent breakdowns, but will improve either output or quality, or both. One advanced plant, for example, has a control system that automatically shuts down a machine tool when the cutting tool has worked on a predetermined number of pieces. The worn tool is then replaced. This is truly advanced PM—far beyond the periodic inspection routine followed by many companies. It is typical of a current trend in highly mechanized industries.

But no matter to what degree it is refined, an efficient PM plan must include at least (1) periodic inspection of plant and equipment to curtail machine downtime and prevent harmful depreciation; and (2) upkeep of plant to correct harmful operating conditions while they are still in a minor stage. PM's great emphasis is on prevention; it does not include regular maintenance or repairs.

I. Why PM Is Needed

Any well-designed PM program will save a lot more than it costs. Typical comments of factory managers give a clue as to possible benefits: "Our breakdowns were cut 50% in a year." . . . "Trouble calls in this plant were cut in half in six months." . . . "We reduced maintenance manhours 20%." . . . "The spare parts inventory got 20% smaller." . . . "We had an increase of 11% in the productive operating time of equipment."

The advantages of PM make an impressive list: (1) Less production downtime because of fewer and less serious machine breakdowns. (2) Less overtime pay for breakdown repairs. (3) Fewer large-scale repairs; less crowding of maintenance manpower and equipment. (4) Lower repair costs because less manpower, fewer skills, and fewer replacement parts are needed for planned shutdowns than for emergency breakdowns. (5) Fewer product rejects, less spoilage, because of properly adjusted equipment. (6) Less cash spent for premature replacement of parts and machines, because of better conservation of all equipment.

(7) Less standby equipment needed, thus, less capital investment. (8) Lower regular mainte-

"The element of cost dominates an effective PM program, and determines what can be done."

nance cost. (9) Identification of items with high maintenance costs, leading to correction of causes such as misapplication of machine, operator abuse, obsolescence. (10) Better work flow because of fewer emergency jobs. (11) Better spare parts control, and greater economy. (12) Better labor relations because workers are not laid off due to breakdowns. (13) Greater safety for workers and equipment. (14) Lower unit cost.

PM can be applied successfully to all types of operations, large and small. One maintenance executive of a company having several plants applies PM to his smallest operation of three maintenance men, as well as to his largest with 250 men.

The element of cost dominates an effective PM program, and determines what can be done. Economy, in a sense, must over-rule engineering efficiency. For example, to the engineer it might seem engineering folly to let a $500 motor burn out to keep a production line in action. But it makes common sense when balanced against a $2,000 loss that would result if the line stopped for motor repair.

This emphasis on cost may seem odd to the technician; it will not seem so to top management.

There is no ready-made PM program for any plant. PM must be tailored and cut to fit the measurements of the individual company. Problems of maintenance differ. A chemical plant, for example, may need to hire a corrosion engineer; a food plant may need a sanitation engineer. But a clothing manufacturer has no use for either one—it has its own special needs.

PM should probably not be applied to the entire plant at the start. It is usually best to convert one department at a time, or maybe one type of equipment through the whole plant.

Inspections are the bedrock of PM. They are expensive. Thus, the basic problem is to strike a favorable balance between (1) the inspection cost, and (2) the cost in excessive repairs, replacements, and downtime of not following a PM plan.

II. What to Inspect

A survey of 542 American plants having PM plans, conducted by *Factory Management & Maintenance*, shows that PM was applied to various types of assets as follows: motors were subject to PM control in 78% of these plants; production machinery—66%, control equipment—64%; buildings—62%; materials handling equipment—60%; process equipment—52%; service equipment—50%; lighting—49%.

What the individual plant should include in PM depends on local conditions. An effective program usually includes all of the critical equipment, and much of the supporting equipment and property. It will include, too, special seasonal functions as well as general care of equipment—for example, pumping out a refrigeration system not used in winter months.

One plant which applies PM to 80% of its equipment includes a machine if PM saves money over casual maintenance methods. The manager says "We do not inspect about 400 non-critical small motors in PM. Failures amount to 5 to 10 motors a year. Most failures are hard-to-detect faults in motor winding. Inspection costs would exceed the $400 annual replacement cost."

Another plant reports: "We arbitrarily limit our inspections to items costing above $500."

Ask yourself these questions: (1) Is this a critical item? Will its failure cause a production bottleneck, or costly damage, or harm to an employee? (2) Is standby equipment available in case of failure? (3) Does cost of PM exceed the cost of downtime, or repair, or replacement of this item? (4) Is obsolescence expected sooner than decay? If so, PM may be a waste of money.

What parts of each piece should be inspected? Many of the inspection points on a machine can be determined by general plant experience. But outside help is needed, too. One of the best sources of inspection information is the service manual issued by the manufacturer.

After the points for inspection have been determined for each piece of equipment, a checklist should be made. This is simply a printed form for the inspector, listing all points to be examined on the piece. It provides spaces for dates and initials to show when inspected, points inspected, and by whom. Checklists assure uniform and complete inspections regardless of who does the job.

III. How Often and When

Over-inspection is a needless expense; it may involve even more downtime than would be caused by emergency breakdowns. Under-inspection is a greater evil. The art of PM is to strike a good balance. Again, no two plants are alike. Age and kind of equipment, type of operation, etc., must be considered. In many cases you can get helpful inspection timetables from equipment manufacturers, for old machines. When new machines are installed, have the vendor provide simple, workable instructions.

Remember, too, that one piece of equipment may have several cycles of servicing—such as daily for cleaning, weekly for adjustment, monthly for functional inspection, and yearly for general overhaul.

To figure the best inspection cycle (or cycles) for a machine, analyze these factors: (1) Age, condition, value; older equipment needs more frequent servicing; obsolete machines may not be worth the expense of more than just minimum inspection. (2) Severity of service; the rougher the use, the shorter the cycle. (3) Safety; allow a wide margin. (4) Hours of operation; many firms use frequency cycles based on an 8-hour day; others base theirs on usage (such as mileage). (5) Exposure; what is exposure to dirt, friction, fatigue, stress, weather, corrosion? (6) Damage; is the machine subject to heavy vibration, overloading, abuse? (7) Adjustment; is machine subject to loss of adjustment? Are close tolerances required?

A work schedule is the next problem to solve. Nearly every plant can divide its PM inspection

and service function into three parts—routine upkeep (adjusting, lubricating, cleaning); periodic inspections (visual, teardown, overhaul); and contingent work (jobs done when equipment is dismantled for rebuilding, relocation, etc., for example, inspection of gas burners when relining a furnace).

In scheduling both routine upkeep and periodic inspections, handle them on the day shift if possible to avoid overtime wages, and maybe higher night-shift wages. Try to distribute the work evenly, month to month, week to week, to spread the cost. (But schedule PM work during slow seasons if you have them each year.) Try to schedule PM for periods of normal downtime; for example, when machines are being set up for production.

Inspection schedules are of two types—"over-all charts," and "individual cards."

Over-all charts list on one large sheet every piece of equipment in the plant or department. This is the simplest method, and gives a quick picture of the PM workload. A typical chart lists days or months across the top border, and itemizes equipment down the left side. Inspections are indicated by checkmarks in the appropriate columns all across the page. A different symbol can be used to show cleaning, adjustment, overhaul, etc.

Individual card systems consist of a record card for each piece of equipment. They are often combined with regular equipment records. They have the advantage of being able to carry detailed inspection instructions.

Scheduling inspections that will idle production units is the PM manager's most difficult job. To overcome the natural resistance of the production staff requires tact and cooperation. One way is by "flexible" scheduling. The schedule gives a leeway of 30 days on PM inspections, where possible. The PM foreman then fits his work in at the most convenient times—usually when the machine is idle. Production people who realize the value (to themselves) of PM will usually help find some free time for the PM crew.

The PM executive, in any case, must try to coordinate his operation with production. Here are approaches that plants have found workable: (1) Schedules are suggested to production supervisors and foremen. They are not told; they are consulted on dates. (2) The maintenance executive sets up a tentative schedule for an entire year, circulates it to production heads for correction and approval. (3) The PM manager sends advance notice of major inspections to production sections, stating reason PM is needed and estimating downtime. (4) The maintenance "planning group" (a committee of top management, production supervisors, and maintenance supervision) sends a weekly report listing units due for shutdown the following week; instructions to conform are included.

IV. Who Inspects

No company need disturb its maintenance organization to install PM. Follow these basic principles.

- Do not allow PM work to be interrupted by other maintenance work. Resist the temptation to keep repairs moving faster at the expense of PM. Eventually the decrease in breakdowns will release enough men from repairs to enable you to schedule PM comfortably.
- The routine work of PM should follow the same administrative principles as any other factory operation—as to authorization, labor, material, reports, costs. The point is: PM should be elevated to this formal status—not handled as a stepchild of factory management.
- The PM function should be directed by the executive who directs other plant maintenance. If you have a maintenance force of 100 or more men, you will need a full-time PM manager.
- Inspection reports (used to control and check the work of PM crews) and inspection manuals (that give the PM inspector his detailed instructions for each type of equipment) must be introduced and worked into a simple system by the PM manager.
- Paperwork should be kept simple. Generally, no more than five new forms are needed for a complete PM program: equipment inventory sheet; inspection checklist (for each type of equipment); inspection schedule; inspection order (or authorization); and equipment service and cost record. Two or more of these should be combined, wherever possible. ●

How Two Plants Operate PM Programs

Small Plant

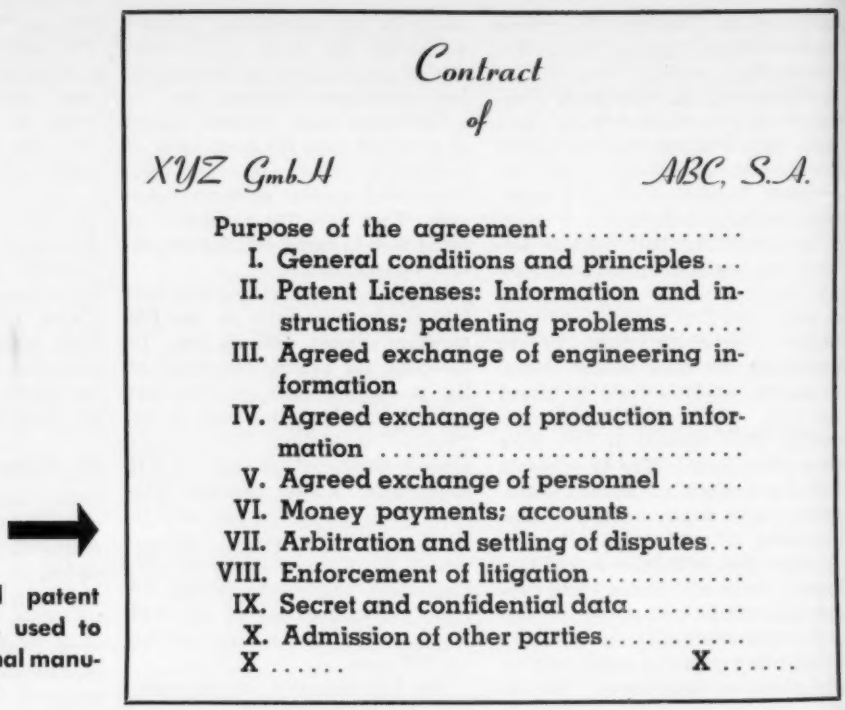
Company has 15 maintenance men. The factory supervisor doubles as maintenance executive, with the aid of one special clerk. PM schedules for general plant services —lighting, heating, etc.—are set up on separate, large annual charts. The equipment record is kept on large cards for all machinery and service equipment. These are kept in a box file. PM schedules (for each piece of equipment) are kept on smaller cards. These are kept in another box file, using weekly calendar tab separators. File serves as a tickler.

Each week the tickler file and charts are consulted for PM work due the next week. Clerk issues orders on regular work-order forms, and holds tickler cards in a special file. No checklists are used. Completed inspection reports are reviewed by maintenance executive, who issues repair orders. Clerk refiles charts and schedule cards, according to next due date. Repairs get normal follow-up depending on importance of job. Costs of repairs are hand-posted to the equipment record cards.

Medium Plant

Company has 50 maintenance men; uses cards and a box file as equipment record. History of maintenance and costs are posted there. PM requirements of equipment—mostly machine tools—are scheduled on a running-time basis. Purpose is to service machines only when they actually need it. A letter-size chart is kept for each machine. PM frequencies for a running inspection, shutdown inspection, and teardown inspection are predetermined for each machine and are marked on each sheet.

Every week the maintenance clerk marks the hours of actual operation on each machine chart, as reported by the production department. As each chart marking nears the predetermined PM inspection points, the clerk notes the machines that are due for attention. He then delivers appropriate inspection checklists (one for each machine) to the maintenance foreman. Inspectors and repairman are then assigned. When service is completed, the foreman fills out a report form which is delivered to the maintenance clerk.



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X. Admission of other parties.....
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This is a typical patent license agreement, used to promote international manufacturing business.

Overseas Contracts Spur Profits

Digested from PRODUCT ENGINEERING, Aug, p196

Part of the international trend in business these days is the special exchange agreement that commercially links two companies located in different countries. The "technical service contract" (TSC) is a relatively cheap and effective way to exchange engineering information and manufacturing data.

The TSC (see sample above) is a combination agreement covering (1) the licensing or cross-licensing of patent rights, and (2) a plan by which technical knowledge used by a manufacturer is made a part of the patent license. The drawings, manufacturing instructions, test data, sales manuals, sales plans and customer information are all delivered to the concern obtaining the license. Along with this, engineers and production men go into the foreign plant and actually put the licensed patents into operation. In some cases, whole plants are designed, and machinery ordered.

For example, a British firm manufacturing eye-glass lenses for the local market developed a new type of bifocal lens and a unique method of making it. The firm entered into a TSC with an American concern. Licenses were granted giving the American company the right to use the invention and manufacturing instructions. (The British firm obtained American patents, and assigned its rights.)

The British factory manager was loaned to the American company; special machinery was shipped from England to the U.S.A. Manufacturing methods were thus introduced, and the American company tooled-up for production.

At first the lenses were exported to the U.S.A., despite the high tariff, and were used to develop the market. As soon as American sales grew to sufficient size, exports were replaced by the U.S. plant.

Often the TSC is a two-way arrangement: each party has a group of patents and assigns rights to the other. Additional inventions, if related to the originals, are "cross-licensed."

Success of a TSC depends largely on human factors. Diplomacy and mutual understanding are vital. Information, often confidential or secret, must be furnished by both parties. Differences of language and temperament must be overcome. Men must be sent at the expense of the other party to work in the other's plant—and frequently given some authority there. All this takes patience, skill and tolerance.

The advantages are many, assuming the TSC can be worked in smooth fashion:

- Competition in the other country (or countries) can often be controlled legally—based on sound legal advice in each case.
- There is greater freedom in doing business in many cases, and less conflicting rights and patents.
- Trademarks can be protected by registration of trademark rights. (Most TSCs cover this.)
- Infringing imports into one's home country can often be curbed.
- When exports to a country suffer because of language barriers and distribution troubles, a local partner may be the solution.

Caution: In dealing with U.S.A. firms, be sure to obtain skilled legal advice concerning the U.S. Anti-Trust Laws. American partners strictly limited by them. ●

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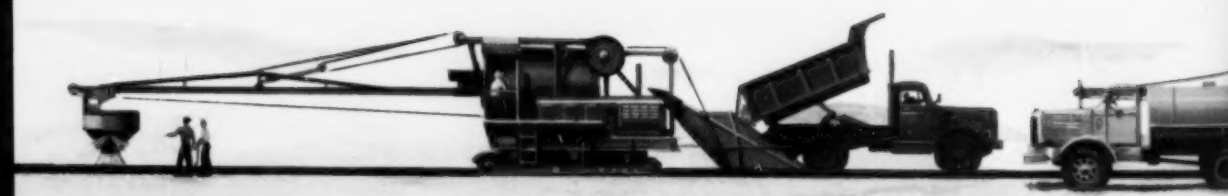

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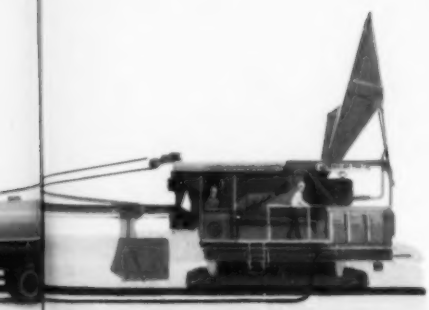

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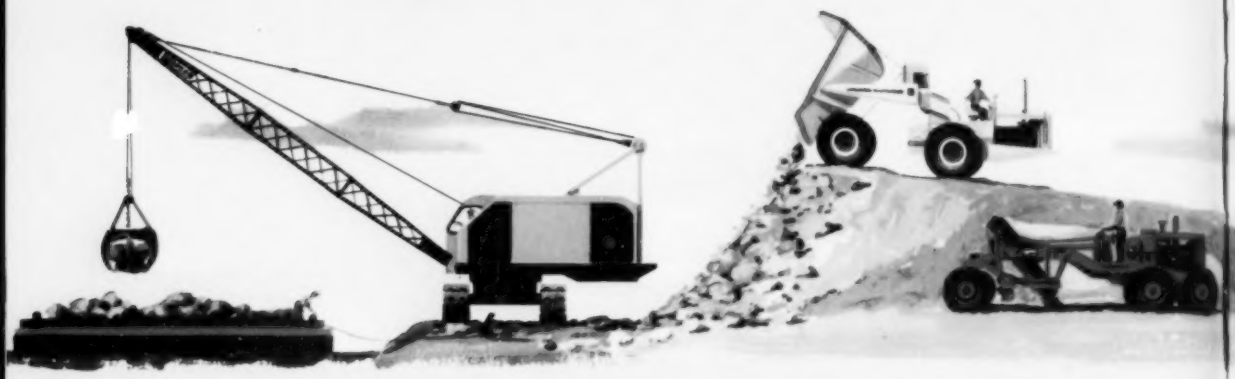

AMERICAN LE TOURNEAU-WESTINGHOUSE GALION

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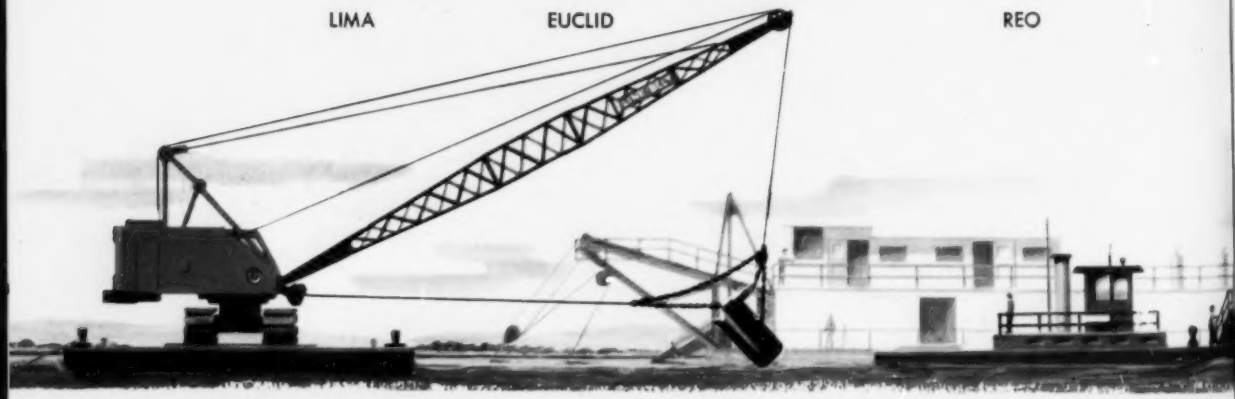

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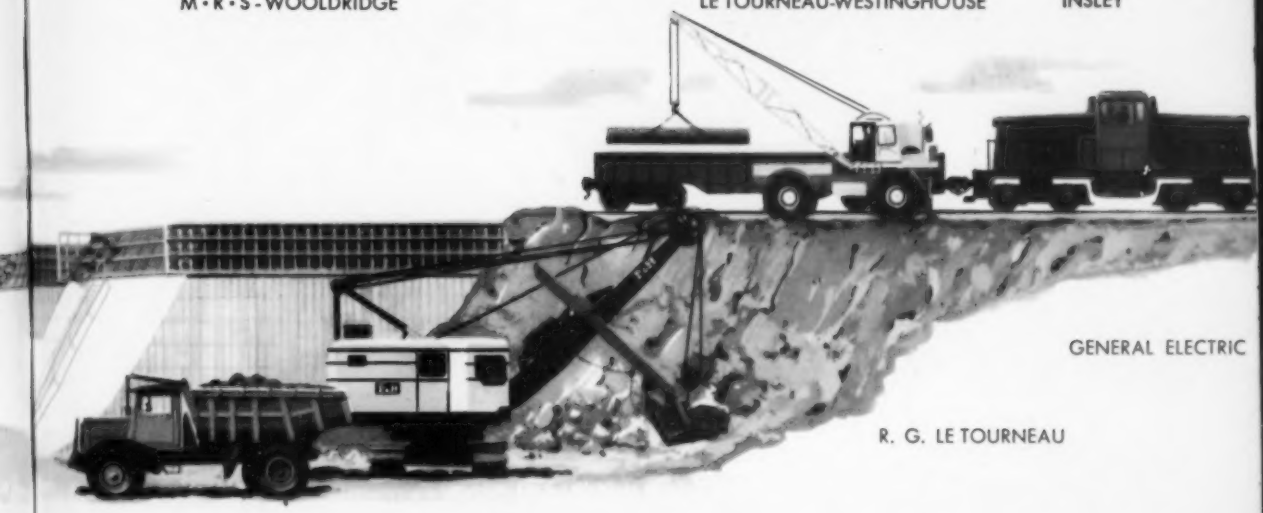

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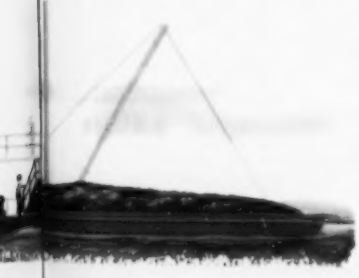

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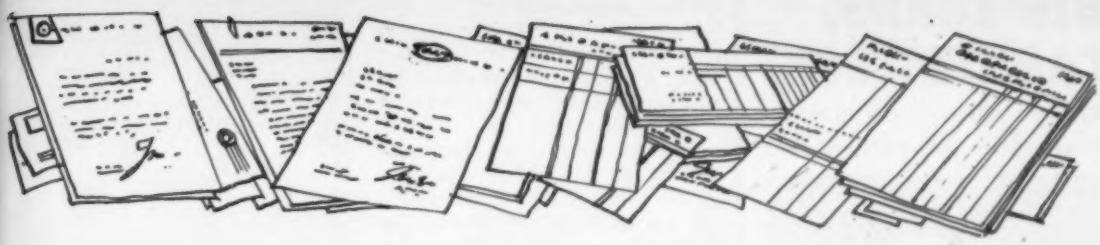

Climbing a Paper Mountain

Has paperwork and reading material taken over your desk? No need to be ashamed of having lost this battle. Most executives have lost it. Here are some ideas for a new practical approach.

Digested from BUSINESS WEEK, Aug 18, p43; FACTORY MANAGEMENT & MAINTENANCE, Sept, p84

The higher a man climbs up the executive ladder, the more he has to read. His range of interest expands right along with his authority. Soon his mind is crammed with the wide knowledge that it takes to run a business.

And soon his desk looks like a paper hurricane had hit it. Books, reports, department summaries, magazines, personal letters, memorandums, old files—all are piled high and wide across the room. The executive despairs. Control of his private office, with its immense burden of reading and remembering, seems hopeless.

And so he musters extra energy and tries to catch up with his reading on weekends, and on planes and trains. But these remedies are only temporary—and exhausting. He needs a new approach.

Here are some suggestions to help the average paperwork victim, prepared by the editors of *Business Week* and *Factory Management & Maintenance* from the experiences and opinions of numerous executives in American industry:

• **Eliminate Waste Paper**—Shut off the source of reading matter that should never reach your desk at all. Outdated correspondence, detailed catalogs, reports that overlap and duplicate others, technical reports that the engineers should be reading (and maybe summarizing for you)—these and many others should be stopped before they clutter your private office.

Have your secretary sort and distribute routine material. Assign a junior executive—or anyone who knows the overall operation—to the job of screening all paperwork in a routine fashion, sending the bulk of it to experts and department heads throughout the company. One high-level American executive employs a capable young college graduate to do nothing but screen all paperwork that reaches the administrative offices.

When you think of a new idea, or any project that requires study and planning, remember that prudence pays when it comes to having staff prepare background information. Ask for all you need, no more. Recently an executive decided that a warehouse was needed in a newly developed sales territory. He had his secretary contact a score of architects, asking for ideas, facts, and figures. Within two weeks he was nearly flooded out of his office—so eager and so voluminous were the replies. (He turned over the warehouse idea to two company experts—the division sales manager in the new territory, and the chief engineer in charge of physical planning and development.)

"If you ask for periodic reports to get background information for a new project, and the project later

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loses its appeal, then cancel it out fast . . . don't let it drag on and have the reports pile high on your desk." So says a Chicago executive who admits that it took him years to learn this simple rule.

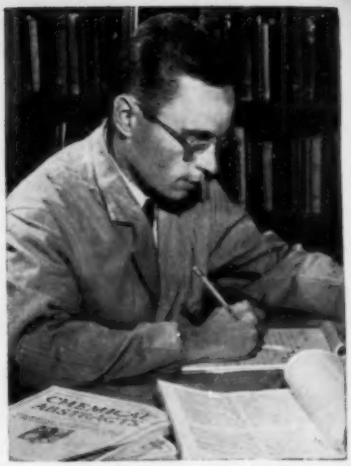
• **Use a Shelf System**—For reading matter that is interesting—maybe even vitally interesting—but not essential to the running of your business, keep a table or bookshelf within easy reach of your chair. This way you can scan magazines (for example) as they arrive, insert slips or paper clips marking articles you want to read thoroughly, then put them aside—to be read in leisure moments.

• **Plan Your Paperwork**—Three general rules can help you handle essential paperwork, day by day: (1) Begin each day by writing down, briefly, the items of business and reading that you will complete by day's end. Fix an allotted time for reading mail, dictating letters, reading staff reports. Dispose of all mail before you leave for the day. This may mean answering letters, approving reports, forwarding items for action by others, or marking items for future action (using a tickler file). The idea is to take some decisive action on every single item of mail before the close of the day.

(2) Group the items of business before you, according to the people they each concern. If you have four items to discuss with the sales manager, why not bunch them and complete all four with a single personal visit or telephone call? This is especially helpful where an administrative executive makes many visits to the factory to talk with the supervisor.

(3) Use a tickler file for items on which action is postponed to a future day. Label 31 file folders with numbers 1 through 31, for each day of the month. File items accordingly for follow-up. Each morning pull out the folder for that day; treat the filed items as though they were incoming mail.

Reading courses to improve reading ability can help a lot (see MD, Oct.) But remember, learning to read faster will be no help at all if it merely enables you to jam more reading into your waking hours. You might be worse off than ever.●



Documentation Expert . . .

New Team Member

Digested from CHEMICAL WEEK, Sept 8, p80

A new man has been added to the traditional scientific research team by companies in the U.S.A. and Europe. He is the "documentation chemist"—or metallurgist, or physicist, depending on the nature of the business. Thus far, the chemical industry has been his chief bailiwick.

His duties cover a wide range. Mainly he gathers, evaluates, processes, and disseminates scientific information to the team in the laboratory. He is a combination librarian, reporter, and "idea man." Properly utilized, he can save up to 25% of the laboratory man's research time—time now spent at library labors.

Smith, Kline & French Laboratories (Philadelphia) and Charles Pfizer and Co. (Brooklyn) are two leading drug firms in the U.S.A. that have added documentation experts to their research teams. Their operations are similar to those of several European concerns.

According to the senior research scientist at Smith, Kline & French, a good example in their plant would be a team developing a new type antispasmodic drug. The group would include a documentation scientist, an organic chemist, a biochemist, two pharmacologists, a gastroenterologist, and a pharmacist.

At Pfizer the idea has been used

for a number of projects. For example, a documentation scientist played a vital role in an important antibiotic research study.

Qualifications—The documentation scientist (or engineer) should have a broad scientific training and practical background. Preferably he should be versed in several fields of science, in addition to the specific one in which he is working. He should have a college degree covering his specialty; should also have laboratory experience, training in book research, and at least a fair ability for putting ideas on paper.

He must get along well with other researchers and scientists (this is very important, of course, where there is a "team" operation); he must be adept at securing cooperation between individuals both on and off the project team. Maybe most important, he must view the problem from all sides—including the budgetary side—and at the same time be well aware of laboratory details.

Duties — The documentation scientist has no trouble keeping busy. Among other things, he should:

- Keep abreast of current literature in the field.
- Attend academic and industry meetings to discuss research, and acquire new ideas from scientists outside the company.
- Establish relations with other institutions, especially advanced schools, to secure up-to-date information.
- Perform liaison work between team members, and between the company and other companies in the industry.
- Take action to remove bottlenecks that slow down the team's progress.
- Supply new ideas—a function that should grow logically from his position and wide contacts.
- Prepare written reviews of related literature, and progress reports for the benefit of top management.

A single dispute among companies that use documentation scientists clouds their full acceptance. The sole objection: making one man the "idea man" on the research team, and thus tending to subordinate the creative talents of other members. ●

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"GROUP DYNAMICS"—A NEW APPROACH TO TRAINING AND . . .

A Way to Produce Group Leaders

Digested from THE TIMES REVIEW OF INDUSTRY, Sept, p10

Businessmen will be hearing a lot about "group dynamics" in the next year or two. This concept—actually a method of high-level training—may be one of the keys to supervisory and executive development that industry has long needed, and never found.

If you attend many company conferences—and what executive does not?—you will appreciate that a prime need is for (1) a way to make group meetings much more productive than they are, and (2) a way to develop group leaders (executives) who can take charge of meetings and guide them to effective results. Good leadership and responsive participation are in great demand.

Group dynamics may furnish the answer—a teaching method that relies on student participation in practical exercises, and probes the basic elements of the group leader's role, the group member's role, and the function of the group as a whole.

The idea was developed in the U.S.A. by members of the National Training Laboratories, which is a branch of the National Education Association of America. (The writer attended a six-weeks special course at the Gould Academy in Bethel, Maine, U.S.A., conducted by the NTL. He was one of three British members on a 22-person mission to America, sponsored by the European Productivity Agency, Paris.)

The form of training is called "T-Group" (Training Group). The purpose is to allow a person to see himself at work as others see him—an experience which can be both exhilarating and humbling. This is the method:

Fifteen or 16 trainees sit around a large table together with a man designated as trainer. The trainer is originally looked to by all members as the person who will give guidance on how the sessions will be run. After a time, members realize that this man is giving no guidance at all. Some become irritated at his lack of leadership; others may suggest topics for discussion, and these proposals may or may not be accepted by the group. Periodically the trainer will intervene to suggest what is in fact taking place in the group. He may point out that various members have tried to take the lead in guiding the group; some having a degree of success, others not.

The trainer is something like the chorus in a Greek play. He describes what is happening within the group—but without helping resolve the tensions that may be apparent to the members.

Members may talk about whatever they wish. Once this is realized—and further, that the sanction for continuing with a topic lies with the members and not the trainer—the trainer is no longer a threatening figure. It usually takes several hours of discussion before most members see the trainer in this light.

It is gradually realized that the insights into the working of the group can in some ways be generalized, and applied to other work groups. Sometimes these observations are made by members, sometimes by the trainer. For instance, is voting by a show of hands the best method of gaining assent? Does silence indicate agreement? Under what conditions will a person disagree?

Gradually, course members begin to see the importance of emotion, and realize that in every meeting there is the inter-play of two levels of reality. On the surface is the task, the immediate

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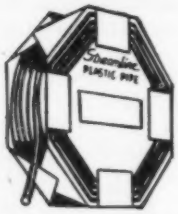

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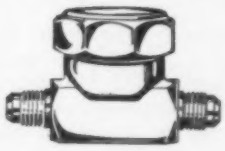

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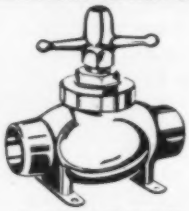

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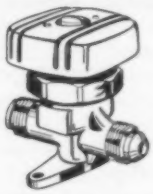

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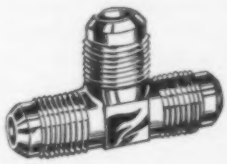

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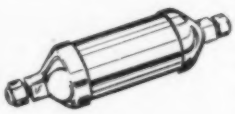

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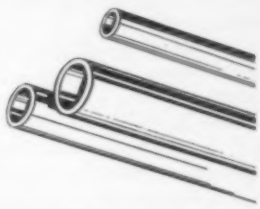

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problem; below the surface are the social and emotional needs facing the group and the individuals within the group. These emotions can help, or hinder, the making of sound decisions.

Certain aspects of running meetings take on new significance for the trainee. How much does a person have to give up—of his own feelings and beliefs—to belong effectively to a work group? What is the real meaning of consensus of opinion? What must be done to deal with problems rationally, not emotionally? Is it possible to arrive at decisions so as not to give rise to a jubilant majority and a resentful minority? This form of training permits a person to ask himself and others these very searching questions—and to attain reasonable answers.

Running simultaneously with the T-Group are three other forms of training which are part of group dynamics. These, too, give insight into human behaviour:

- Theory sessions—where lecturers illustrate and explain the great power of group standards and what happens when people try to push a group too fast, or try to dominate a group.
- A-Groups—informal afternoon gatherings, practice sessions where novice group leaders are shown how difficult it is sometimes to institute social change and reconcile genuine differences.
- C-Groups—community groups, very much like what the British Army calls "grouse-sessions." The purpose is to allow people to come together and talk "off the cuff"—informally and candidly—about aspects of the course which bother or frustrate them.

These exercises reveal the power, resilience, and heart-warming solidarity that can be maintained in work groups. This dormant productivity cannot be harnessed through inspired leadership alone. It depends on each member helping to create an atmosphere of mutual confidence in which the gifted can contribute to the benefit of all, and the silent feel encouraged to speak. The best chairman is a moderator, not a dominator. This is the type which industry needs so urgently. More than anything else, the chairman's job is one of coordination. ●

Ideas for the Personnel Man

Higher education for lower ranks . . . Time-clock trouble . . . Ladies in the laboratory . . . Your supervisor's personality . . . A golden ear for ideas . . .

COLLEGE TRAINING for top executives is surely nothing new. But surprisingly enough the idea has been extended by some concerns to include lower-ranking employees. Companies suffering because of poorly trained personnel are starting to send plant supervisors, foremen, and lower ranking workers who hold key jobs, to special college courses—usually to learn specific skills. In September, for example, salesmen from scores of paper box companies entered classes in six leading colleges in the U.S.A. Their subjects: packaging products for the public. The Folding Paper Box Association sponsored the college courses and participation by its 200 member companies. Idea was to stimulate the salesmen to fresh thinking, and combat the trend toward use of aluminum foil and plastic film in packaging.

The American paper box industry is not alone. A U. S. Chamber of Commerce survey shows that 248 American trade associations were active in 1955 in some sort of college training program—with the trend toward higher education for lower-level personnel (*Wall Street Journal*, Sept. 11, p1).

●

TIME-CLOCKS caused workers at Miniature Precision Bearings, Inc. (Keene, New Hampshire, U.S.A.) to form long lines at the time clocks just before the closing whistle blew. To beat the crowd, workers would leave their benches and wash up early. Soon the plant was losing five minutes production time per worker per day. Now MPB uses the honor system—and no time-clocks. Workers mark their own timecards. There is no queuing up. And, among 400 workers, there have been only three cases of cheating that required discipline in the last 2½ years (*Factory Management & Maintenance*, Sept. p141).

●

YOUNG LADY engineers are going to work at Armstrong Siddeley Motors Ltd. (Coventry, England). The company is recruiting girls under 21 to help with research and development on gas turbines and rockets. They will be given engineering training—enough, at least, to analyse engine test results and problems of engine stress and weight (*American Machinist*, Sep 24, p 171).

●

YOUR SUPERVISORS (and you) might like to see this item clipped and put on a bulletin board. It's about personality and leadership.

Recently a large U. S. manufacturer made a careful study involving several hundred supervisors and department heads working in the company's many plants. Findings show that supervisors fall into four distinct categories: (1) The army sergeant type—His main goal is a set of rules and regulations that will cover every situation that comes up in his department. He is cautious, avoids mixing with his people. His main interest is his own security. He gets little loyalty. (2) The self-sufficient type—He gets work out somehow, regardless of human relations. He wants advancement, more power, and refuses to delegate authority. He antagonizes workers, causes them to lean heavily on the union.

(3) The diplomat—He takes great pride in his ability to "handle" people. He uses different attitudes to get various kinds of results from various types of people.

He is insincere—and often the workers know it. Management may trust him—to a degree. (4) The team man—He is the type top management is looking for. He has two prime qualities that mark him for success: first, an honest "group spirit" with a reasonable appreciation of both his own and his workers' abilities; and second, a habit of delegating authority—with the intelligence to do it wisely (*Supervisory Management*, Sept, p23).

●

A GOLDEN EAR for ideas is the latest trick for promoting more employee suggestions at General Electric Co.'s Medium Induction Motor Department (Schenectady, New York, U.S.A.). The ear, pictured above, is gilded papermache. A tiny microphone inside picks up an employe's verbal suggestion, then relays it to a hidden tape recorder. Later the suggestion is transcribed and delivered to the Suggestion System Committee.

●

WANT PEOPLE TO KNOW what your plant looks like? Try making picture postcards of it; give them to employees and visitors. Lederle Laboratories Division of American Cyanamid Co. does this at its plant in Pearl River, New York, U.S.A. Cost is about ½ cent each. Over 500,000 are distributed each year.

●

"MR. CHECK" is a welcome personality at the plant of Westinghouse Electric Co. (Columbus, Ohio, U.S.A.). He strolls through the plant daily, tapping workers on the shoulder and giving them five silver dollars if they can answer three questions on improving quality (Last three items from *Factory Management & Maintenance*, Sept, p140).

▶ YOU AND YOUR PERSONAL AFFAIRS

"Tranquilizing drugs"—the new breed of chemicals used to relieve nervous tension and all levels of anxiety—are creating a hot controversy among the medical experts.

The public—and especially businessmen—have received the tranquilizers with open arms—or open minds. Retail prescription sales in the U.S.A. may top $125-million this year, and may double in 1957. There is no doubt about the drugs living up to their advertisements. They do tranquilize."

What worries the experts—in the medical profession, in government, and even in the drug industry itself—is that these potent drugs may be doing a lot more than just subduing the tangled nerves of patients. They may—say their critics—be causing dependence on drugs, jaundice, palsy and related disorders, and maybe even permanent injury to the nervous system. And there is little doubt that they often cause slowed mental reactions and drowsiness. The American Psychiatric Association and other medical groups are taking action. By research they are trying to unearth the truth about such drugs as meprobamate, chlorpromazine, reserpine, promazine and azocyclonol (sold under numerous trade names); and meantime, they are hoping to stem the tide of popular acceptance until the tranquilizers can be proved a blessing or a danger.

Many medical men suspect that the drugs will prove themselves a real blessing when used under close medical supervision, and a real danger when used like aspirin tablets by a careless and jittery general public. In the U.S.A., in Latin America, and in Europe, the tranquilizers are being used on patients of all ages to treat not only a wide range of psychiatric troubles but also such physical disorders as high blood pressure. The drugs serve to calm and relax without actually causing sleep. The trouble is, say the doctor, very little is known about the true mechanism of anxiety, or about the long-term effects of the tranquilizing drugs.

Nobody knows for certain, for example, that even the mild tranquilizers—meprobamate, piperadol, hydroxyzine, benactyzine—do not have a serious long-range bad effect on habitual users. Apart from the purely physical harm that might be involved, the psychological possibilities are alarming. A "normal" amount of anxiety—the reaction to a genuine threat—is beneficial, psychiatrists say. It spurs the individual to seek a solution to his problem. But a society of tranquilizer addicts might well lose some of its intellectual spirit and motivation. Some doctors rate this as Number One among the hazards involved in widespread use of the drugs.

What happens when a person continues to use an emotional crutch? Medical men are wondering. Most of the newer transquilizers are regarded as less dangerous in this respect than reserpine or chlorpromazine. They are non-toxic and, reportedly, not as habit-forming as even barbiturates. But, say the critics, the fact remains that they are pills and that users tend to rely on them for help over the rough moments in life—thus they must be mentally habit-forming.

How Two Aggressive Companies Build

1. Westinghouse Expands Abroad

Refrigerators, power plants, and 83 licensees make up this electrical concern's growing empire.

OLD-STYLE HARD SELLING is the motto of William E. Knox (picture, below), aggressive president of Westinghouse Electric International Co. "WEICO" is the export division of America's giant Westinghouse Electric Corporation.

Knox—operating from New York—has produced impressive results in the past few years with his dynamic sales concept. In 1949, WEICO sales were about $74-million. This year they will rise to about $109-million. And the firm looks for a 10% yearly growth over the next decade.

The biggest items of trade are heavy industrial goods—particularly electrical installations. WEICO's chief pride is its "packaged" power plant program—which even includes an order for an atomic reactor for Belgium. Also, Knox has been increasing sales of Westinghouse home appliances overseas, such as refrigerators and washing machines.

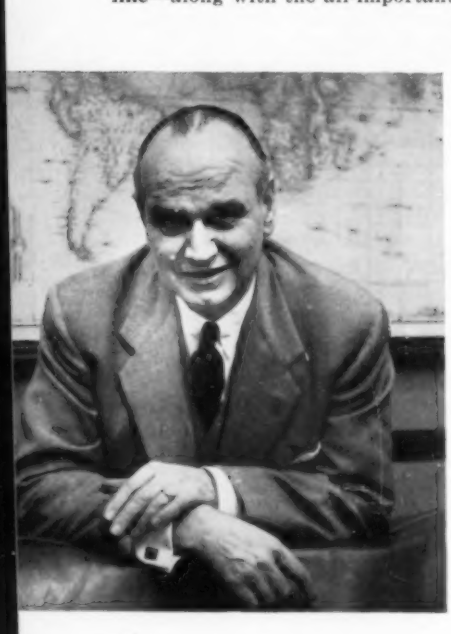
Knox is building the appliance line—along with the all-important industrial sales—in a way that has his Pittsburgh headquarters smiling. For years WEICO was the lost child of Westinghouse—tolerated for its potential but not taken too seriously. You get an idea of how that attitude has changed from what happened when Westinghouse had its serious labor troubles last winter.

A strike lasted 156 days; Westinghouse was badly hurt. During this period WEICO's sales income accounted for just 7% of Westinghouse's gross; but WEICO's net income amounted to more than 25% of Westinghouse s total net.

WEICO's key asset is manpower. William Knox says: "All we are is a selling outfit—we make nothing." Of 809 WEICO employees, 650 are in sales—91 of these are in the field. In their selling, WEICO personnel traveled 1,400,000 kilometers in the first half of 1956.

WEICO's organization parallels the parent company. There is an apparatus division, a growing consumer products division, and an area sales division. The first two work closely with Westinghouse's factories. The area division—split into the Americas, Europe & Africa, Far & Middle East, and U.S.A. (for selling to other exporters)—deals directly with overseas customers.

License agreements with independent companies overseas are now one of the mainstays of WEICO's international business. In 1919 WEICO became an "independent" corporation and took over sales offices and subsidiaries—in England, France, Italy, Norway and Russia—set up years before by the founders of Westinghouse. But since 1925 WEICO has gotten rid of most of these, converting several to a licensing basis. The right to make patented Westinghouse products, and use patented processes, is granted by license. Today WEICO has 83 licensees in 23 countries. For selling, the firm has 341 distributors in 133 countries and territories.



WILLIAM E. KNOX takes charge of Westinghouse's overseas operation.

WEICO puts up several arguments in favor of license agreements. Licensing, says president William Knox, causes less resentment and more cooperation in foreign countries than do U.S.-controlled subsidiaries. The WEICO licensee is locally owned but gets the benefits of Westinghouse product research and development. Moreover, Knox explains, a country with exchange problems is more likely to allow royalties from a licensee to be remitted to the home office than it would profits from a U.S.-owned subsidiary.

Sales of Westinghouse's 8,000 electrical products, of course, are WEICO's big source of income. But licensing turns a handsome profit, too. Today licensing income is probably over 10 times the 1926 figure.

The 83 licensees employ a total of about 200,000 workers; last year, these licensees produced, among other things; around 300,000 Westinghouse refrigerators. These companies range in size from a tiny fluorescent-bulb plant in Spain to Argentina's big Siam di Tella, LTDA.

Licensing arrangements are flexible. For example, consider Brazil's Luis Villares Elevador Atlas Co. A WEICO licensee, it is now reportedly the third largest elevator manufacturer in the world. It is so successful that Westinghouse is borrowing some Atlas patents. WEICO often finds its own salesman competing directly with a licensee, and considers this a real stimulus to aggressive selling.

Plans for the future include an ever-greater effort at Knox's brand of salesmanship, and more emphasis on WEICO's portfolio investments abroad. ●

Build Foreign Business

2. Petrofina Aims at U.S.

A Belgian oil firm—small by industry standards—begins invasion of world's largest oil market.

THE MAN AT THE MICROPHONE (picture, right) is leading Belgian Petrofina into a marketing operation that promises to be among the most interesting ever to hit the international oil industry. Laurent Wolters, head of Cie. Financiere Belge Des Petroles (Petrofina) of Brussels, has started his move to compete with the giant U.S. oil companies on their home grounds—amid the auto gas pumps that dot America's highways.

A few weeks ago the stockholders of Panhandle Oil Corporation (Wichita Falls, Texas, U.S.A.) voted to merge their independent oil producing concern with American Petrofina, Inc.—U.S. subsidiary of the Belgian group. Oilmen in Europe and the U.S.A. assume that this relatively small merger (for Panhandle Oil is just a $15-million firm) is just the opening move in Laurent Wolters' bid for a place in the U.S. retail oil market.

They expect a lot more such moves of Wolters in the next year or two. And they believe that the head of Belgian Petrofina is just the man who can offer the U.S. oil "giants" a real marketing battle.

Look at Wolters' and Petrofina's history. As a relatively small company in an industry of giants, the firm arose fast to become a marketing factor in Europe in just 10 years. And in the past three years it has proved it can make a success on the fringe of the U.S. companies' home territory—in Canada. Canadian Petrofina (another subsidiary) has become a prime factor in eastern Canadian oil marketing by capturing 10% of retail sales there.

Petrofina's success since World War II is spectacular when you consider that the group lost most of its West European installations during the war. Moreover, the postwar Communist advances in Eastern Europe cost Petrofina its holdings in the Romanian oil fields.

Petrofina's postwar progress has been a remarkable tale of shrewd financial maneuvering and the kind of hard-hitting practical approach that U.S. businessmen like to think that they alone possess. Now these Americans are watching Wolters. They are expecting more mergers, more outright purchases of smaller firms, and exchanges of prospecting rights—all kinds of "deals" as Petrofina strives for an important place in U.S. oil.

After World War II—with his company in a dire position—Wolters threw his energy into a clean-up and rebuilding operation. Before too long, the firm was reestablishing itself on the Continent and in Britain. Through contracts with British Petroleum Co.—and by aggressive marketing—Petrofina soon had the advantage of a new refinery in Antwerp, and cut out for itself about an 8% share of the United Kingdom retail oil market.

Today, the Petrofina empire extends over Europe from the Pyrenees to the borders of Eastern Europe; it covers most of Africa and Canada, and is studying the potential in Latin America. There are industry reports that Petrofina's oil discoveries in Angola (Portugese West Africa), and the plans for a refinery there, may mean the company will some day attempt to exploit Latin American markets across the Atlantic.

Petrofina has 63 subsidiaries located in 24 countries. It has an oil tanker fleet approaching 1-million tons. Its profit in 1955 was $8.5-million—or $3 per ton for oil products sold. The issued shares of Belgian Petrofina increased from 570,000 in 1950 to 4,626,000 today, with a present valuation of $333-million.

The boldest move in Petrofina's postwar program came in 1950, when Laurent Wolters and his associates in Brussels decided to launch their attack on North American markets.

LAURENT WOLTERS, Russian born oilman is head of Belgium's Petrofina in the U.S.A.

First target was Canada—a sort of half-step to the U.S.A. Canadian Fina Oil (Canadafina) was organized in Calgary (Alberta) with a capital of $7-million. This firm today has an interest in a dispersed group of producing oil wells and explorations that cover 20,000 hectares.

Wolters and associates did not stop with the setting-up of Canadafina. A chance to extend operations came in 1953 when Alfredo F. M. Campo, an Italian-born Canadian oilman, went to Wolters with a proposal to launch another oil company. With Campo's access to Canadian capital, Petrofina organized Canadian Petrofina, Ltd. to acquire crude oil and producing wells. The firm soon went beyond crude production, and built at Montreal one of the world's most modern refineries.

Its chain of automobile service stations rounds out Petrofina's activities in Canada. This year Canadafina launched a building program to add 500 retail outlets to its present 1,200.

Petrofina's service stations are helping change Canada's whole gas-marketing pattern by providing ultra-modern designs in buildings and up-to-date merchandising, something new in many towns in Canada. Now, the next step is to carry the "Fina" trademark to U.S. highways. ●

Digested from BUSINESS WEEK, Sept 8, p148; Sept 15, p132

In Marketing—Ideas That Sell

Coffee makers . . . Brussels, 1958 . . . TV gets no results . . . TV gets fine results . . . Italy's challenge to Detroit

COFFEE MARKETERS are putting millions of dollars into laboratory research these days—and are trying to keep their activities secret, in spite of the aroma. In fact, true coffee aroma is their objective. They want to find an "instant" (powder-form) coffee that will have the smell of roasted coffee beans. Whoever does it first will capture the entire instant coffee market, says one expert. In the U.S.A., instant brands now account for one of three cups of coffee consumed at home—something that does not please Latin American coffee growers, since instant coffee uses fewer beans per cup than regular varieties. (*Wall Street Journal*, Sept 20, p1)

●

FIRMS wishing to exhibit at the Brussels International Exhibition, 1958, should notify either foreign trade officials or their industry association by the end of this month, if possible. This trade fair will be the first of its kind since before World War II. Fifty nations are participating, and unlike many other trade fairs, each plans to have its own pavilion. Dates are April 17 to October 19, 1958; 30-million people are expected by the fair's promoters.

●

CLOSED-CIRCUIT TV did not work for 50 British journalists recently. The result: a firm had trouble selling itself to the press. The journalists were invited to see the starting of a new tonnage oxygen plant in South Wales, built by the British Oxygen Co. But the journalists were not taken to Wales to see the new plant in real life. Instead they were invited to the company's London office to see the plant start up via closed-circuit television. A button was pressed, and they saw the plant in Wales begin to operate.

But the TV tour of the premises proved a dismal failure. Due to heavy rain at the plant site, the sound effects were unintelligible, and much of the tour was meaningless. And when it came to question time, in the London office, the answers supplied direct from Wales were a jumble of static. Moral: closed-circuit television is a good public relations idea. But it had better work.

●

TELEVISION PAYS. Gumption Products, Ltd., London, relied this year almost entirely on 30-second TV announcements between regular programs. The firm reports that in one recent month sales in the London area were 158% over the 1955 rate. In the Midlands area the jump was 372%. In areas not covered by TV, the increase averaged only 8%. (Last three items from *Business*, Sept, pp60, 63, 93).

●

MOTOR SCOOTERS made in Italy by Piaggio & Co. and The Innocenti Co. are being pushed hard in the U.S.A. in spite of the 20-year failure of Cushman Motors Co. (Lincoln, Nebraska, U.S.A.) to popularize the tiny vehicles in America. Many auto-minded Americans still think of the "noisy little monsters" as nothing more than a teenager's plaything. Despite this known apathy, Piaggio alone will spend $250,000 to promote U.S. sales. Target: 10,000 sales in 1957—with the aid of big advertisements and promoting scooter "clubs."

Meanwhile, sales of foreign bicycles in the U.S.A. are growing—half a million in the first half of 1956, 10% ahead of the first half of 1955. That is despite the sharp tariff increase on imported bicycles last year. And note that Germany, for the first time, has presently edged out Britain as the leading supplier of imported bicycles. (*Business Week, Sept.* 23 p 159.)

FINANCIAL DIGEST

What are "smart" American investors doing with their personal funds? Each year, *Business Week* interviews businessmen known to be astute investors. The results present an interesting, though hardly scientific, cross-section.

A year ago, *Business Week* found many of these investors reducing their holdings of common shares, increasing their interest in real estate and local businesses. This year, real estate continues highly popular, and there is a much greater interest in the security and yield of bonds. But despite the uncertainty that has marked the stock markets, there is a surprising amount of confidence in industrial stocks.

True, investors say the market is "tired," that stocks are "overpriced," that tax-exempt bonds now "yield much more than stocks and at less risk." And most investors expect a sharp fall in stock prices. Yet nearly all believe that, for the long-term future, common stocks are a sound way to grow with the American economy.

Real estate may be more popular this year, especially residential and prime business properties in growing suburbs. Many investors believe that if high interest rates continue, better real estate bargains will be available.

Despite all the worries over international problems, high interest rates, elections, the American businessman-investor acts as if he expects continued growth, peace—however uneasy, and inflation.

●

A unique new life insurance company is to be set up in the Netherlands. N. V. De Waerdye plans to invest all its funds, including premium income, in shares of Rotterdamsche Beleggings Consortium, a well-known investment trust which itself only invests in ordinary shares.

When a policyholder pays a premium, he is entitled to a share in De Waerdye's investment. The value of each share, called "Waerdye fractions," will be one guilder when the company begins operation. After that, the value of the fraction will be fixed, and published, each month. All payments to Waerdye, and by Waerdye, will be based on the guilder value of the fractions.

●

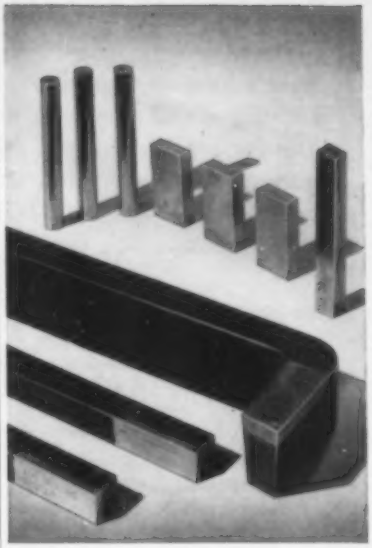
Creole Petroleum Corp., the giant Venezuelan oil producer, has insured its installations for $460-million. The 15-company underwriting is probably the largest in Latin American history.

The policies are "$1-million deductible" (Creole pays up to $1-million of any loss), and cover refineries, terminals, power plants (but not wells) against natural disaster, civil disturbances, sabotage.

●

Finding depositors—and capital—was the problem for Republic Savings Bank, Manila, Philippines. The bankers knew there were millions of pesos hidden in homes—in cans, bamboo tubes, under floors, or buried outside.

So the bankers bought two armored cars, with "paying" windows, "receiving" windows, and air conditioning. These banks-on-wheels have toured the country areas, convincing Filipinos to open bank accounts. So far, the cars have helped Republic Savings Bank attract 120,000 depositors.



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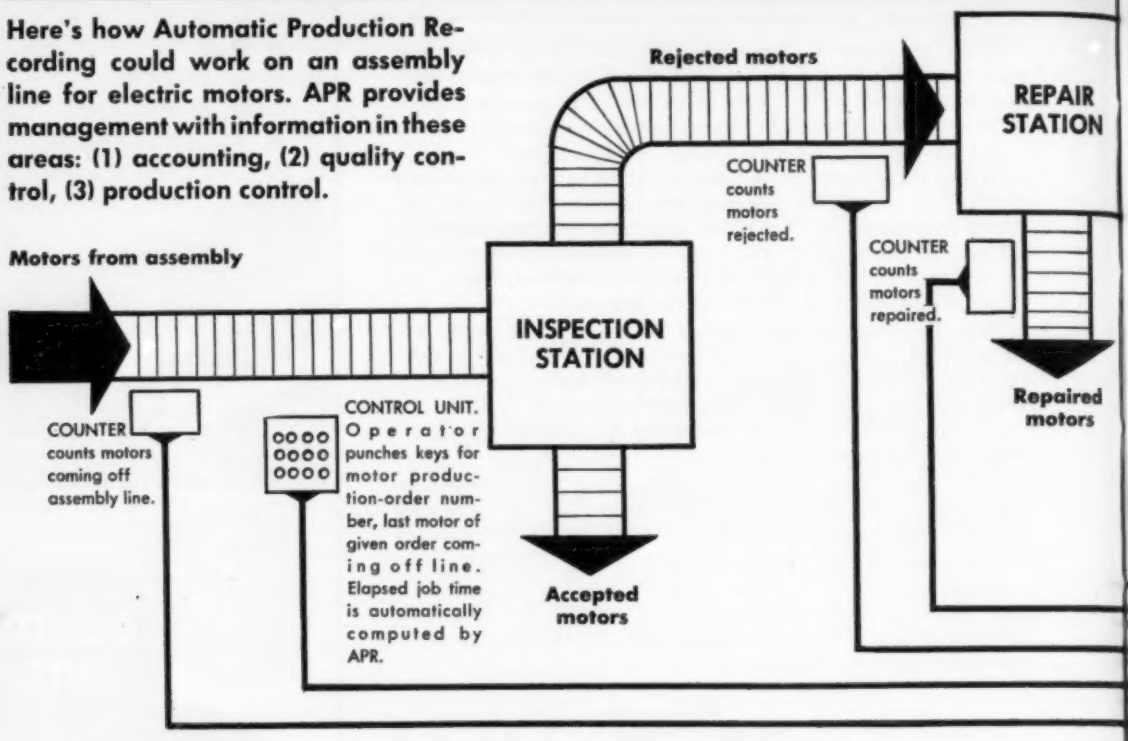
DELORO STELLITE

BELLEVILLE ONTARIO

Here's how Automatic Production Recording could work on an assembly line for electric motors. APR provides management with information in these areas: (1) accounting, (2) quality control, (3) production control.


Rejected motors
REPAIR STATION
COUNTER counts motors rejected.
COUNTER counts motors repaired.
Repaired motors
Motors from assembly
INSPECTION STATION
COUNTER counts motors coming off assembly line.
CONTROL UNIT. Operator punches keys for motor production-order number, last motor of given order coming off line. Elapsed job time is automatically computed by APR.
Accepted motors

New Machines Process Plan

A few weeks ago, International Business Machines Corp. gave the public its first look at four new products. Three of them represent an entirely different approach for IBM. They emphasize electronic data processing, but you have your choice of using or not using the punch cards which have long been closely identified with IBM business systems. IBM feels that the new devices will make possible "automation" of data handling for 20% to 25% more operations than is possible with older equipment.

Two of the new products are data-processing systems: the RAM 650 (basically a standard IBM computer with a memory unit added) and RAMAC (a new type of accounting machine). The "RAM" in each name comes from "Random Access Memory:" The machines accept and process information continuously, rather than in periodic batches as in current punch card systems.

Of special interest to production management is a new data-collecting system called Automatic Production Recording (APR). It picks up information at the process point and continuously organizes it (illustration, above).

The fourth new product is an automatic electronic attachment, called Autotab, for standard IBM electric typewriters. It saves typists from having to change the tabular setting or to position the carriage by hand in filling blanks in business forms. The forms will have to be printed in a special electrically conductive ink, but after that Autotab will seek out the blanks to be typed in and will automatically position the carriage. It will be sold as extra equipment on new IBM electric typewriters.

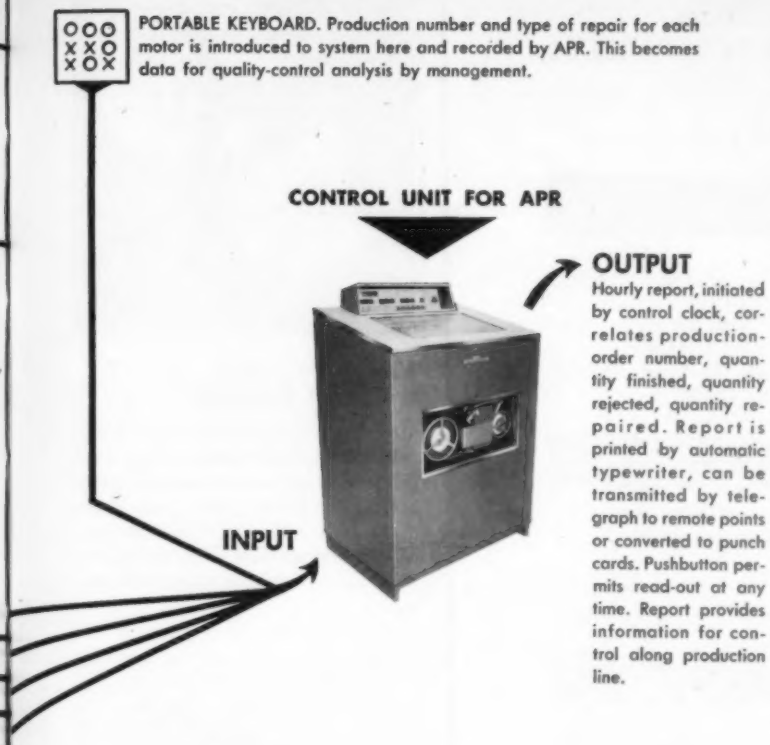
I. Production Recording

The hypothetical installation shown in the drawing provides an idea of what APR can do in a plant producing electric motors on an assembly line basis. Let's say management wants this production information:

- **For accounting purposes:** the number of motors inspected and approved, the number produced on each order, and the elapsed production time. This information forms the basis for up-to-date cost and production reports.
- **For quality control:** the reasons motors fail to pass an inspection.
- **For production control:** hourly reports on production, rejection, and repair rates, and also instantaneous on-demand readings for these items at any desired time between scheduled hourly readings.

APR does all this. It collects data needed from several stages along the assembly line. Quality deficiencies can be detected quickly enough for effective action. And management has at all times an accurate picture of just what is happening to the product on the assembly line.

APR is capable of much more


PORTABLE KEYBOARD. Production number and type of repair for each motor is introduced to system here and recorded by APR. This becomes data for quality-control analysis by management.
CONTROL UNIT FOR APR
OUTPUT
Hourly report, initiated by control clock, correlates production-order number, quantity finished, quantity rejected, quantity repaired. Report is printed by automatic typewriter, can be transmitted by telegraph to remote points or converted to punch cards. Pushbutton permits read-out at any time. Report provides information for control along production line.
INPUT

and Office Data

complex operations than this. It can be connected to scales, flowmeters, counters, clocks, IBM punch card readers, voltmeters, and many other sources of data. It organizes the information they provide, stores it, programs it, and either prints it on a typewriter or perforates a tape that can be run through an automatic card punch machine or transmitted by teletypewriter to a central office. APR is not as fast as the electronic brains; its maximum output is about 10 characters per second. But its accounting-as-you-go performance lets you watch a process from start to finish and it suggests changes that may be made in the middle of the run. And it can relieve production personnel of a host of clerical chores: keeping job sheets, time cards, order numbers. The people who usually do this work can be freed for other jobs on the production line.

Several APR units are already operating. One is being used on a time study project at a R. R. Donnelley & Sons Co. printing plant. Four others are going into the rod mill of a major steel producer to keep track of billets that go in and finished products that come out.

II. Random Access Memory

Punch cards store information. But it takes a relatively long time to search their "memory" for the information that you want. The same thing can be said of magnetic tape.

On the other hand electronic memories yield information in little time. Before IBM's Random Access Memory, there were only two general types of electronic memory:

- **Immediate-access memories,** which store a small amount of information, but discharge it on demand in a few millionths of a second.
- **Drum memories,** which store information on the surface of a metal drum that can be spun rapidly. These hold more data but yield it up more slowly.

Compared with these memory devices, RAM is slow, but it has as much capacity as the slower large-capacity storage systems such as punch cards or magnetic tape. It takes about a half second to remove one bit of information from RAM's memory.

III. Using RAM

The RAM principle is used in both RAMAC (Random Access Memory Accounting Machine) and the more complex RAM 650. IBM calls RAMAC a "slow" data-processing machine, because it requires a few seconds to digest its instructions, locate the data and come up with an answer. But it is fast enough to keep up with the activities of small to medium-sized businesses, because it keeps going continuously.

For example, in a warehouse operation, RAMAC could keep a complete tally on stock and customers. If an order was received, say, for a certain number of alloy steel bars, RAMAC would indicate in seconds whether or not the item was in stock, would subtract the quantity from inventory, would check to see if re-order was necessary and enter the amount for billing.

RAMAC will accept directions and data from punch cards or a special IBM typewriter, will deliver data in either form. It has the capacity to make comparisons, do the necessary arithmetic, and store data in process. It has both an immediate-access memory for speed and memory to store working data, as well as the RAM storage system.

RAM 650 is similar, but it incorporates the considerably higher logical and arithmetical capacity of the IBM 650 medium-sized digital computer. It can handle enough data to store in four RAM units (these four files would have a total capacity of 24-million digits). In addition, it has the traffic capacity to handle queries from and deliver data to as many as 10 remote input and output consoles with electric typewriters. **(IBM World Trade Corp., 807 United Nations Plaza, New York 17, New York, U.S.A.)**

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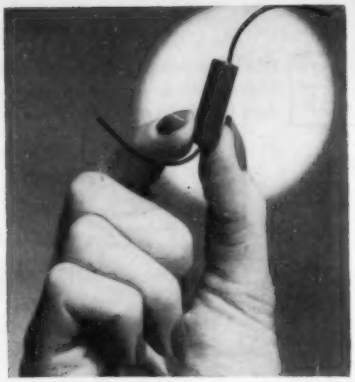

New Battery Has Unlimited Shelf-Life

Practically unlimited shelf-life is claimed for a new low-current, solid electrolyte battery. Made primarily of silver, silver iodide and vanadium pentoxide, the quarter-ounce cell can withstand −70 to 170°F. with no appreciable change in voltage.

Its theoretically infinite life (when not in use) derives from its completely dry construction and operation. The battery uses no liquids, gases or vapors, nor does it form any when in operation.

The new battery is now in pilot-plant production and will be developed further. **(Union Carbide International Co., 30 East 42nd St., New York 17, New York, U.S.A.)**

●

"Copy Anything" Machine Reduces Paperwork Time

The Apeco Dial-A-Matic Autostat makes a dry photocopy of any original, any color, on any kind of paper (opaque or transparent), without additional equipment. It prints, processes, and dries automatically. Copies are ready for instant use. Because of this speed and simplicity of operation, the manufacturer says it will save up to 80% on copy jobs, eliminating costly manual copying or expensive outside copy service.

The machine takes less than 22 inches of work space. It is easy to operate, with a new simplified dial control that instantly adjusts the machine automatically to the type of copy to be made. **(American Photocopy Equipment Co., 1920 W. Peterson Ave., Chicago 26, Illinois, U. S. A.)**

Mobile Fire Extinguisher

A mobile foam fire extinguisher has been designed for use in industry and in ships where fire risk arises from the handling and storage of highly inflammable materials.

Basically, the extinguisher consists of a steel container mounted on a two-wheel tubular frame. A new foam pre-mix machine is claimed to have a number of advantages over existing foam generators. It produces 50% more foam per gallon of liquid content; it is easier to charge and operate; it is simpler to handle and maneuver; its operational weight is lighter by about 200 pounds; it loses none of its efficiency at low temperatures (down to 30°F.); and it can be recharged in a few minutes. **(Pyrene Co. Ltd., 9 Grosvenor Gardens, London, S.W. 1, England)**

•

Steel Tiles for Sturdy Floors

Perforated steel tiles, 12x12x$\frac{1}{2}$ inches, are designed to armor-coat floors subject to heavy abuse. Laid in wet concrete, the tiles are said to provide years of service without cracking, chipping or noticeable signs of wear. The steel sections are particularly recommended for areas subjected to the pounding and abrasion of small-wheeled trucks, dollies, fork trucks, skid boxes.

The steel tiles can be laid as quickly as the base is prepared. Bond is provided by anchors on the underside, punched from the steel itself. **(Bethlehem Steel Export Corp., 24 Broadway, New York 4, New York, U.S.A.)**

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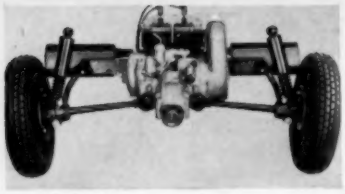

Four-Passenger Car

German auto called Goggomobil measures 2.9 meters long, weighs only 383 kg. and can exceed 60 miles per hour. Unusual rear-end design (picture, left) has engine in the same unit with gearbox and differential. The engine is a fan-cooled parallel twin stroke, 293cc. engine with four-speed gearbox and reverse gear. **(Hans Glas GmbH, Dingolfing/Bayer, Germany)**

•

Remote Automation Control

A new method for recording and controlling process data from a remote indicator and control point has been developed in Britain. The system operates over a single wire with a ground return, or for large distances, by means of a very high frequency radio link. It will record such variables as pressure, temperature, radioactivity, physical displacement, and power output. **(British Physical Laboratories, Quadrant Works, The Houseboat, Radlett, Hertfordshire, England)**

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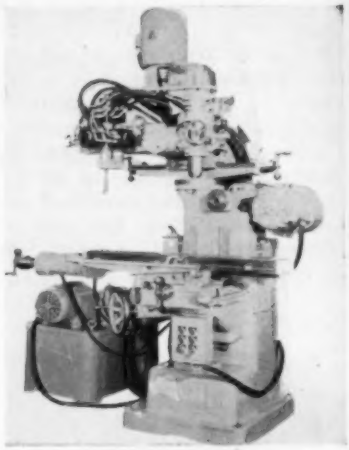


3-D Milling Machine

Model 10RH milling machine will mill, jig-bore, and duplicate in three dimensions. The machine has a hydraulic duplicator attachment for making duplicate molds and dies or for contour milling to templates.

The duplicator sensing tracer head controls movement of the table, knee, and ram slide. As the operator moves the stylus over the master, the cutter duplicates his movements.

Only 4 ounces of stylus pressure are required to reproduce accurately a metal, plastic, or wood master.

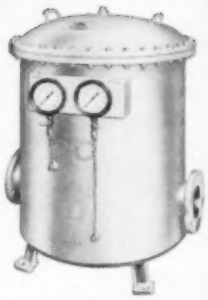
The unit has a reversible ram turret with an all-angle spindle head at one end, a slotting head at the other. The entire turret rotates 360°, so that the machine can be converted from milling to slotting in a few seconds. Any compound angle can be easily obtained. **(Axelson Manufacturing Co., Div. of U.S. Industries, Inc., P.O. Box 58335, Vernon Station, Los Angeles 58, California, U.S.A.)**

CFC

COMPLETE FILTRATION COVERAGE

there's a Commercial Filters unit engineered for your filtering job...

Fulflo FILTERS



Fulflo Filters provide optimum clarity at ultra-high flow rates. For all industrial fluids—including oils, liquid fuels, chemicals, water, compressed air and various gases. Sizes to handle flow rates up to 1,600 gpm. Pressures to 4,000 psi.

Fulflo Filters feature Honeycomb Filter Tubes, the "precision controlled density" element that filters every drop again and again to give you microscopic clarity. Choice of cotton, acetate, nylon, orlon, dacron, dynel or glass fibres.

Standard models available in steel, stainless steel, rubber lined steel or nickel-plated brass. Custom models engineered to special requirements.

Honan Crane FILTERS

Honan-Crane Filters offer "clean oil" filtration in diesel, turbine, hydraulic, metalworking and quenching operations. Bulk refill models provide depth filtration with cellulose medium for additive oils and Cranite (fullers earth) medium for straigth mineral oils. Multi-cartridge models feature six different types of cartridges that may be used interchangeably depending on type and degree of filtration desired. Flo-Pac models, installed in line, handle flow rates up to 900 gpm. All have quick-opening covers for ease in changing refills.

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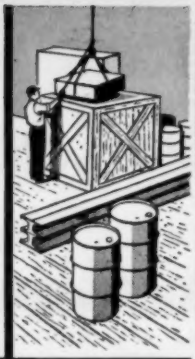
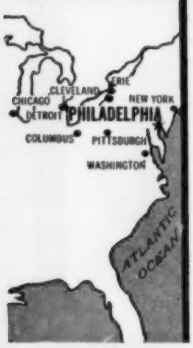


are well handled

when you specify



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MORE PRODUCT DIGEST

Automatic Writer Produces Complete Letter

The Addressograph Model 1938 letter-writer will write a complete letter from blank paper in one run. The machine produces a letter that includes name, address, salutation, letterhead in color, date, text, and signature.

In addition to the complete personalized letter, the new machine will print and personally identify a reply card, as well as print a return address and postal indicia simultaneously with the addressing of the envelope.

The manufacturer claims that, for less than 1¢ a letter, the machine allows any business to capitalize on the advantages of "personalized" mailings. **(Addressograph-Multigraph Corp., 1251 Babbitt Road, Cleveland 17, Ohio.)**

●

Tubing Machines

This new machine is capable of cold-drawing some 10 miles of light-alloy tubing an hour. The tubing is produced in individual lengths up to 130 feet. The machine itself is over 250 feet long.

Known as a "Draw Bench," it produces three light-alloy tubes simultaneously at a speed of 450 feet per minute. The tubes may be anywhere up to 2-inch in diameter. A 3-inch diameter tube may be drawn singly. **(James Booth & Company, Birmingham, England.)**

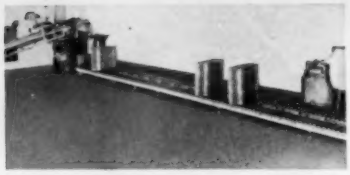
●

Warms Driver's Hands

A British auto-worker has patented a "warm-hands" steering-wheel, for use on all types of vehicles from private cars to farm tractors.

After a four months' test on an open farm tractor, exposed to severe cold weather conditions, farm workers said that even without gloves the wheel had kept their hands warm.

The heating element can either be built into the rim of the wheel during manufacture, or, in another adaptation, attached to an existing wheel. **(Frank Fulham, "Fairfield," Red Lane, Kenilworth, Warwickshire, England.)**



Moves Metal Blanks

The Press-to-Press Automat was designed to handle metal blanks—automatically—between blanking press and secondary presses.

Parts from blanking press are carried by chain conveyor to a stacker. During pre-load interval, gates open on the stacker, and previously stacked blanks are pushed onto a shuttle conveyor. On the conveyor each stack is shuttled in steps to a position just behind previous stack, where it is stored to wait its turn to be fed automatically to the secondary presses. Length of shuttle conveyor can vary to suit specific storage requirements. **(Michigan Production Engineering Co., 1796 E 9 Mile Rd., Hazel Park, Michigan, U.S.A.)**

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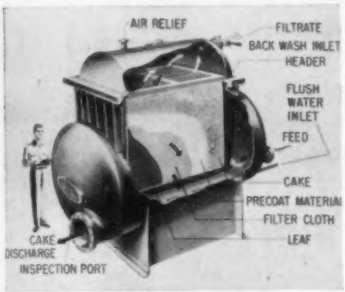
Diesel Pile Hammers—Light, Easy-to-Handle

Lighter than steam hammers of equivalent size, the self-contained Delmag diesel hammers eliminate the need for boilers or compressors, are easy to transport and set up. They have few moving parts and use little fuel.

They are designed so that they can be used with converted steam hammer leads. Hammers are available in 9100- 22,500- and 39,700-foot-pound capacities, with ram weights from 1100 to 2485 pounds. **(Delmag Masch. Fabrik, Postfach 53, Esslingen N., Germany.)**

•



Pressure Filter Has High Capacity

The Hi-Rate Pressure Filter is recommended for oil field secondary recovery operations, as well as for other water filtration applications which require a high capacity unit with low installation and operating costs. It is an upflow, precoated, leaf-type pressure unit, and comprises ten rectangular filter leaves housed in a closed tank, all surmounted by a dome in which filtrate is collected.

During operation, filtered water overflows a filtrate port located near the top of the dome. This drainage of filtrate upward from both the leaves and dome eliminates air pockets which might constrict the flow of water through the filter.

When the filtration cycle is completed, the flow is reversed to backwash the leaves. Water remaining in the dome flushes back through the slots and filter media, completely removing the cake and leaving a clean cloth ready for the next precoat application. **(Dorr-Oliver Inc., Stamford, Connecticut, U.S.A.)**

Excavator-Crane Has 25-Ton Capacity

This new excavator-crane has a gross vehicle weight of 51,000 pounds equipped as a crane. For highway travel weight can be reduced to 41,000 pounds by removing rear outriggers, crane boom and counterweights. For steel erection, model T-24's maximum boom length is 100 feet, with jib booms 15 to 30 feet in length. Lifting capacity is 25 tons. The power unit, incorporated in the chassis, consists of a five-speed transmission, a two-speed transfer case and planetary wheel driving axles. With a 160 brake-horsepower gasoline-chassis engine, a maximum travel speed of 39 miles per hour is possible. **(Clark Equipment Co., Construction Machinery Div., Benton Harbor, Michigan, U.S.A.)**

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RUBBER "BARREL" was designed for hauling oil products by air. Here the venting system of a 200-gallon container is being treated. Filling aperture is at right.

WEB NETTING, which holds the bag in place in the plane, is given strength test. C-47's and DC-3's can carry four of these containers (800 gallons) at a time.

SMALL MODEL is put through severe checks to make sure the bag and harness can withstand the in-flight stresses of changing altitudes, temperatures, and movement.

SAFETY OUTLET for fumes is provided by venting equipment, linked with outside atmosphere through tubing in the plane's fuselage.

Rubber Bags Speed Liquid Air Lift

Rubber bags are being tried as containers for airborne oil products. This new method for moving bulk petroleum products by air was developed in Australia, by aviation officers and engineers of Vacuum Oil Co., Melbourne.

Their purpose was to reduce costs on an air lift from Lae, on the coast of New Guinea, to the isolated Goroka area in the island's central highlands. Later on, the method may be used to supply hard-to-reach points in western, central, and northern Australia.

One advantage of the bags over steel drums is that they can be folded up to make room for other cargo on return flights. This should mean a reduction of freight rates, thus helping keep the cost of the petroleum products down. It will also eliminate the costly, double-handling of steel drums.

Four bags, each carrying 758 liters, can be carried in a C-47 or a DC-3. The bags are placed in position in the planes, then filled from underground storage tanks. On reaching their destination, the bags are emptied by pumping or by gravitation. The empties are then folded to a minimum size and stored in the aircraft for the return trip.

The Mandated Airlines, Ltd., are flying the fuel air lift to the Goroka airstrip. The distance is 192 kilometers, and the altitude at Goroka is 1,500 meters.

The synthetic rubber (Hycar) bags are made by the aviation division of Dunlop Rubber, Ltd. (Australia). They are built to withstand working conditions of 38° C. at an altitude of 6,000 meters.

The containers can be used for all types of liquid petroleum products, including aviation gasoline. Almost a year was spent in developing the synthetic rubber containers.

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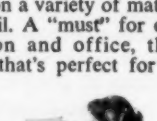
Streamliner 400 — Economical 2-step whiteprinter. Makes prints up to 42" wide (107cm) at speeds up to 24' (7.3m) per minute. Uses sheets or continuous roll stock. Front delivery of copies. Automatic stacking and collating.

ANTARA O-M — Desk top model with many of the fine features found only on larger machines. Small in size, yet provides large-volume capacity. For prints and copies from originals up to 16" wide (41cm) at speeds up to 30' (9.14m) per minute.

With the versatile ANTARA copying process it takes only *seconds* to make the copies you need. This method produces . . . *on 1 machine* . . . copies or prints of charts, reports, drawings, graphs, forms, letters, etc. . . . *anything* which is typed, written, drawn or ruled on paper that is translucent (lets light through).

ANTARA *is economical and easy to use.* Just put in the originals, and out come the clear, dry, legible copies. *Exact* copies of the originals, they cost less per copy than your daily newspaper. There are no messy carbons, no duplicating inks, no stencils.

ANTARA *saves time.* There's less re-writing and re-typing . . . *never* any proofreading or corrections to be made. Copies can be produced in several colors, on a variety of materials . . . paper, cloth or foil. A "must" for every efficient organization and office, there's an ANTARA machine that's perfect for *your* requirements.



Bambino — No larger than a typewriter. Can make 200 copies an hour from originals up to 9" wide (23cm) or from 8' to 10' (2.5 to 3m) per minute on continuous roll. Low in cost; extremely economical to operate.

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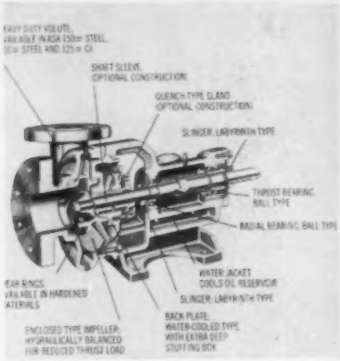
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SLINGER, LABYRINTH TYPE
BACK PLATE, WATER-COOLED TYPE WITH EXTRA DEEP STUFFING BOX

Chemical Process Pumps

Two chemical process pumps, Type DL and DM, will handle most chemical process liquids, hot or cold, in moderate capacities against low, medium or high heads.

An important feature of the new line is the economy of interchangeability of components. To either the Type DL or DM frame, user simply adds the desired back plate (air or water cooled), the desired impeller, and the proper volute case, to build the "proper" pump for the service desired. **(Peerless Pump Division, Food Machinery & Chemical Corp., 301 West Ave. 26, Los Angeles 31, California, U.S.A.)**

●

Floating Water Plant

A new floating waterworks plant consists of a series of welded units bolted together to make up a vessel, on top of which the pumping and treatment plant is mounted. The unit is moored to the river bank by a pivoted arm.

In operation the whole works is automatically activated by a pressure switch. When the pressure of water falls, because of its use in the village or settlement, the switch starts the pump which draws from the pure water tank.

The project does not depend entirely on the availability of electricity. It can be driven by several other systems which have been worked out. Output of plant is about 1,200 gallons an hour against a head of 80 feet with a maximum rate of 2,400 gallons an hour. **(Marston Excelsior, Wolverhampton, England.)**

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From the proud pedigree of the rally winning Anglia and Prefect come two de Luxe models with still more looks and more comfort. Both are equipped with the famous 1172 c.c. engine. Both have new seating and plenty of leg room; a large rear boot with 10 cubic feet of luggage space and famous 'Glide-Ride' suspension for smoother, sweeter travel. *The two-door Anglia de Luxe, the four-door Prefect de Luxe . . . see them both at your local Dealer.*

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You can expect double savings with an Allis-Chalmers Lift Truck

1 Saves Time and Labor

When you put an Allis-Chalmers Fork Lift Truck on the job, the first thing you'll notice is how fast and steady it works. One reason is the ease of operation. You mount from either side — no brake handle or shifting lever to interfere. The seat is comfortable, visibility excellent. Operation is simple — even for inexperienced operators. Result of this operating ease: bonus quantities of material moved every hour. Wide selection of types and sizes.

2 Slices Maintenance Costs to the Bone

"It has gone 6,000 hours and still no downtime." "Up and down a steep ramp for 15 months — repair cost negligible." Reports like these are not uncommon, as Allis-Chalmers lift trucks continue to amaze their owners. When repairs are necessary, the truck can be disassembled in 22 minutes — stripped for servicing in 22 seconds. Features like these save time and money.

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BHE-6

BARREL ARCHES were cast in five full-span pours. Falsework trusses ride on tracks for quick shifting between pours.

GIANT LOUVERS are concrete arches. Members between arches frame plastic panels. Grid above arches acts as brace.

Concrete Louvers Cover Hall

Digested from ENGINEERING NEWS-RECORD, Aug 23, p56

The new exhibition hall going up at Nice, on the French Riviera, boasts the largest concrete roof span in Europe. Indeed, the $3-million building, measuring 95 by 152 meters, is among the largest on the Continent.

The record span is about 88 meters at floor level, and 70 meters between the cantilever tips of buttresses that support the arches.

The exhibition hall provides a permanent location for Nice's annual trade fair. But city officials also hope to attract sports events, conventions and other expositions, particularly during the winter season. Besides the vaulted hall, the project also includes conference and work rooms, dressing rooms and administrative offices. Richard and Michel Langier, the architects, were inspired partly by Italian engineer Pier Luigi Neroi's design for the Valentino Palace in Turin, Italy. They designed the building's roof as a series of giant corrugations, with arches 3-meters apart and about 2-meters deep. One inclined face of each corrugation is reinforced concrete. The other is openwork glazed with translucent plastic panels. The entire structure is overlaid with a grid of reinforced-concrete members (see picture, above right).

The plastic panels face north; they admit light but block the direct rays of the sun. Similarly, the north wall of the building is glazed with translucent plastic, while the south elevation is a concrete curtain wall. Artificial light sources include fluorescent tubes, set in reflectors mounted on the underside of the corrugation peaks. Supplementary lighting can be plugged into outlets installed on the ribs.

Another unusual feature of the hall is the fact that it bridges a stream, the Paillon. It flows through seven 12-meter channels under the building. Channel separators are the foundation walls of a 16,650 square meters reinforced concrete platform that serves both as the floor of the exhibition hall,

FINISHED BUILDING has natural lighting through plastic panels. Span at floor level is 88 meters, a European record.

and as support for a landscaped area outside.

Radiant hot-water panels imbedded in the floor will heat the building. Water is heated by electric heaters, and can be stored until needed.

The huge roof structure was cast in five full-span pours on movable falsework. Forms for the concrete ribs were supported by wood-decked, steel, bowstring trusses. Four track-mounted wood-frame towers—one on each side of the building center, the other two at the ends of the trusses—supported the trusses. ●

New Approach to Roofs in Tension

Radial steel cables laid in the form of a spider web, and covered by a skin of wedge-shaped concrete slabs, form a roof for a small shelter built by students of Columbia University in Litchfield, Conn. Its design is similar to that of a 100-meter circular arena in Montevideo, Uruguay. Both designs overcome up-and-down wind vibration —something that has kept many designers from going ahead with cable structures.

The Columbia building has a roof 15 meters in diameter, supported by 12 evenly-spaced wooden columns. A prefabricated wooden ring sits on top of the columns. Thirty-six steel cables stretch from the outside wooden ring to a central ring of steel about 1.5 meters in diameter. After the cables were in place, they were covered by 524, wedge-shaped, reinforced concrete slabs, only 4.5 cm. thick, and varying in width from 3.5 meters to 5 cm.

Vibration was eliminated by first temporarily overloading the roof with sand bags to pretension the cables, and deflect the shell downward. The narrow gaps between the slabs were filled with mortar while the roof was still loaded. After the mortar hardened, the sand bags were removed. The roof tries to deflect upward, but it is prevented from doing so by its curved shape. The result is an inverted dome which provides a feeling of open space. (*Digested from Architectural Record, Sept. p*211)

ASPHALT MORTAR sprayed on canal surface stops erosion, holds water.

Lining a Canal with Asphalt

Digested from ENGINEERING NEWS-RECORD, Sept. 13, p35

A new process, designed to provide a flexible and durable wearing surface for canals and reservoirs, has been developed by the U. S. Bureau of Reclamation in California. Official designation of the process is "pneumatically applied asphalt emulsion mortar." The material includes sand, portland cement, emulsified asphalt and water. The equipment used to apply the material is a modification of conventional "gunite" facilities, machines that spray a mixture of cement, sand and water through a hose by means of compressed air. So the entire process has become known as "asphalt gunite."

The techniques and equipment as used by the U.S.B.R. could apply to irrigation systems, reservoirs, industrial catch-basins, anywhere in the world. Probably the first requirement is a ready source of asphalt.

The test installations now in their second and third season of service have proven that a non-rigid, water-impermeable, erosion-resistant lining can be applied by the new procedures.

The best mixture developed by the test procedure calls for about 12% emulsified asphalt, 3% to 5% portland cement, about 10% water and the rest sand (percentages are in terms of percent of dry weight of sand).

Modifications of conventional gunite equipment include an improved water ring, for better mixing in the nozzle, and an extra hose line to provide separate sources for the emulsion and water.

Part of the test work was done on a main canal having a capacity of 700 liters per second, water velocity of 2 meters per second, wetted perimeter of 7.5 meters and a water depth of 0.75 meters. Minor repairs were made to an existing concrete lining before the asphalt gunite lining was applied.

The other installation was on a small, unlined, lateral in an irrigation system. It has a 280 liters per second, capacity 0.3 meters velocity wetted perimeter of 3.6 meters and a water depth of 0.6 meters. On these two jobs thicknesses of the linings varied from 2.5 to 5.0 cm.

Cost of the asphalt gunite lining is comparable to other lining or sealing methods. The U. S. B. R. estimates costs to be $2.10 per square meter for each 2.5 cm. of thickness. ●

Construction Trends Around the World

PARABOLIC CONTOUR of a chemical storage building in Haifa, Israel, shelters a 25,000-ton pile of ammonium sulfate without enclosing a lot of waste space. Parabolic reinforced concrete ribs 2.25 meters apart and a 15-cm. thick shell span 30 meters, rise 16 meters at the center.

Reinforced with 300 tons of steel, 1500 cu. meters of concrete for the 108-meter-long structure were placed in 12 pours on movable framework. Solel Boneh Ltd., built it, supervised by the designers, Cementation Co. Ltd., England. (*Engineering News-Record, Sept.* 6, *p*74)

●

PREFABRICATION is speeding a housing project in the new iron and steel center, Norilsk, U.S.S.R., near the Arctic Circle. Hammerhead cranes, riding on rails alongside the building, erect the preassembled components. Precast concrete floor framing, 50-cm. thick brick wall panels, and windows make up the building parts assembled off the site. (*Engineering News-Record, Sept.* 6, *p*72)

●

THIN SURFACES of sprayed concrete withstand tropical climates better than thin surfaces of poured concrete, according to engineers building rain-water catchments in the British West Indies. Basins are scooped out of porous coral. A 3.75-cm. coating of concrete is sprayed over reinforcing wire mesh. (For a similar lining method with asphalt, see the preceding page.)

The hot tropical sun dries out thin coatings of poured concrete so rapidly that it is difficult to obtain adequate compaction and proper curing. Hence, the spray technique. It provides better control over compaction and curing and catchments can be built faster. Curing takes place for 72-hours under wet burlap.

Standard concrete spray equipment, a model 1500 Nucretor made by Air Placement Equip. Co., was used. (*Construction Methods & Equipment, Sept, p*119)

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your

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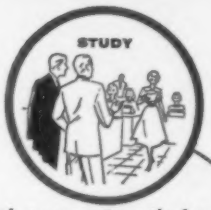

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▶ YOUR MANAGEMENT READING

Management Digest's editorial staff here again does the "worthwhile reading" for you to save your time. For the following literature, please write on your company letterhead directly to the address given, mentioning Management Digest.

Interested in Brazil?—"Brazilian Taxes and Business Organization" contains a check list and useful information for any businessman contemplating investment in Brazil: complete tax laws, sections on how to organize a business, methods of incorporating a Brazilian company, labor and patent-trademark laws. Price is $10.00, which includes reports of changes in laws and pending legislation for one year. (Matthew Bender & Co., Inc., 443 Fourth Avenue, New York 16, New York.)

Employee Training—"Developing People In Industry" discusses training methods and answers the questions: Who shall be trained, what shall be taught, and who shall do the teaching. Price: $3.50. (Harper Bros., 49 E 33rd Street, New York, New York.)

Bulletins From Industry—Illustrated booklet describes in detail the latest in the Master Line of fork trucks. (Lewis-Shepard Products Inc., Watertown, Massachusetts) . . . Four booklets contain worthwhile information on ball bearings. (General Motors Overseas Operations, 1775 Broadway, New York 19, New York) . . . A new line of five industrial tractors for light and medium-duty is described in a 24 page catalog. (Massey-Harris-Ferguson Inc., Quality Avenue, Racine, Wisconsin) . . . A 72-page catalog covers the Shafer line of self-aligning roller bearings. (Chain Belt Co., Milwaukee 1, Wisconsin) . . . A new booklet describes the products and industries served by the Link-Belt Company, manufacturer of materials handling and power transmitting machinery. (Link Belt Company, Prudential Plaza, Chicago 1, Illinois.)

"The Executive Life"—Meet the typical American executive—what he does, and why he does it—in a series of amusing and enlightening articles that originally appeared in Fortune magazine. Price: $3.50. (Doubleday & Co. Inc., 501 Franklin Avenue, Garden City, New York.)

Cutting Costs—"How to Reduce Production Costs" uses actual company experience to describe many important factors affecting manufacturing costs. Price: $1.75. "Company Experiences In Manufacturing Cost Reduction" shows how cost control functions as an integrated part of manufacturing management, rather than as a separate operation. Price: $1.75. (American Management Association, 1515 Broadway, New York 36, New York.)

IFC Plans—Booklet outlines the policies of the International Finance Corporation (See MD, September, page 7). Purpose of the booklet is to inform the world financial and industrial community about the types of investment which the IFC will consider, and about the information required from enterprises wishing to attract IFC funds. Copies, in English, French, German or Spanish, may be obtained from IFC, 1818 H Street, N. W., Washington, D. C., or 67 rue de Lille, Paris (7e), France.

Plastics Around The World—The history of the development of the plastics industry and its present status in practically every country of the world is presented in "Le Commerce des Matieres Plastiques dans le Monde." Information on production statistics, exports and imports, major producers of materials and machines is included. (Les Editions Amphora, 119 Avenue Parmentier, Paris XI, France.)

The Photos show 6,250 KVA A.C. Generator and 5,800 KW Kaplan Turbine for the CNEE of Brazil

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Power
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Today's Secretary

Advertising Publications, Inc.
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Industrial Marketing

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Banking

American Management Association
1515 Broadway, New York 36, N. Y.
The Management Review, Personnel, Supervisory Management

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Business

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Architectural Record

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Petroleum Publishing Co.
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The Oil and Gas Journal

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The Rubber and Plastics Age

Simmons-Boardmun Publishing Corp.
30 Church St., New York 17, N. Y.
American Builder, Marine Engineering, Railway Age, Railway Track and Structures, Railway Locomotive and Cars, Railway Signaling & Communications

Temple Press Ltd.
Bowling Green Lane, London E. C. 1
Plastics, The British Motor Ship

The Times Publishing Co., Ltd.
Printing House Square, London, E. C. 4
The Times Review of Industry

Welding Engineer Publications, Inc.
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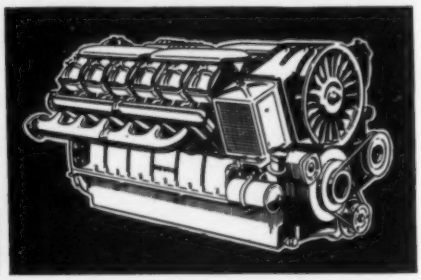

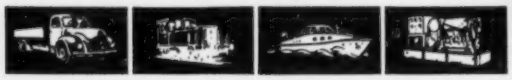

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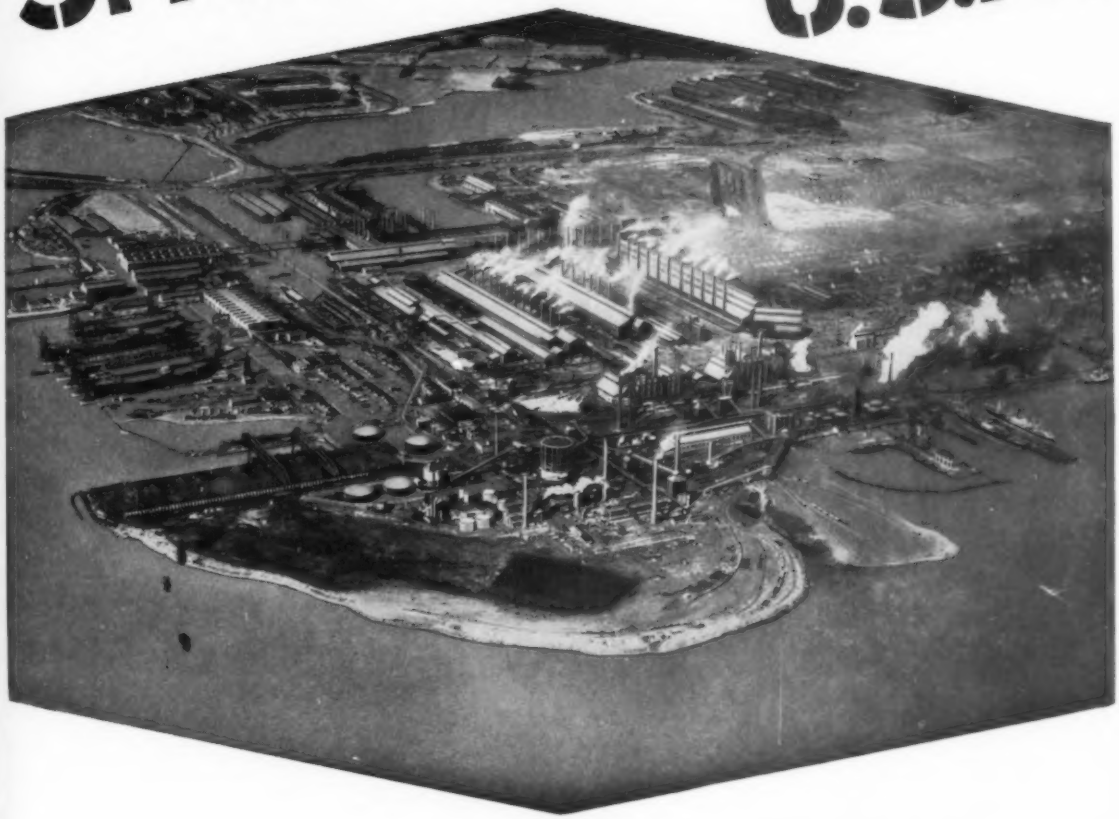

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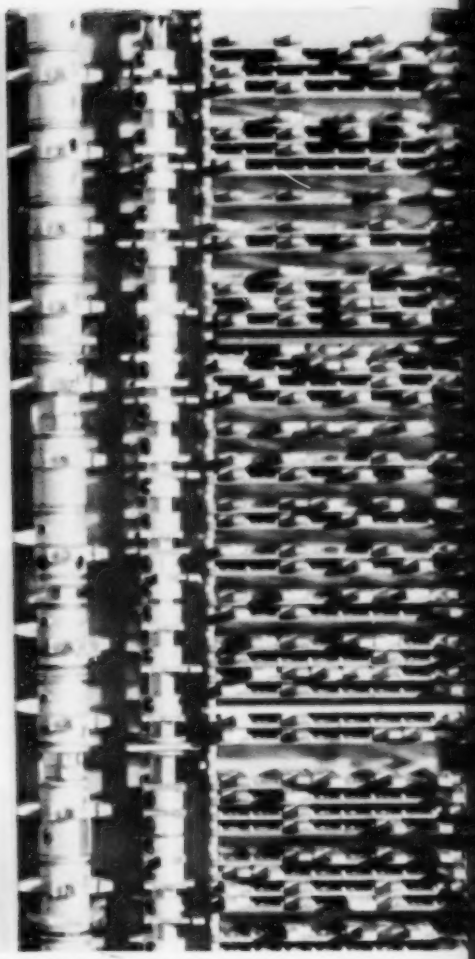

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